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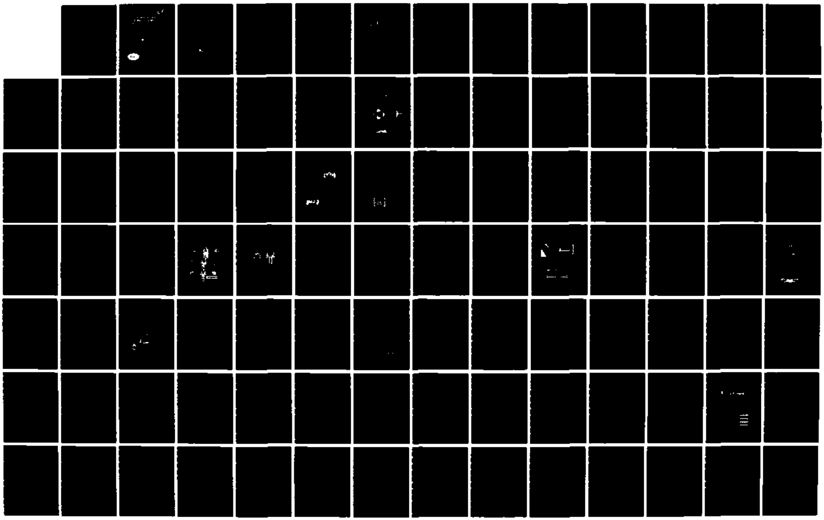

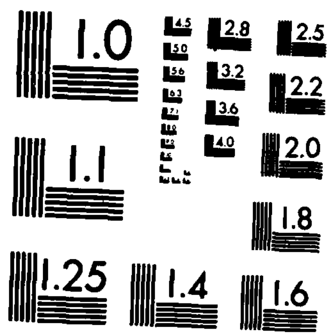
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NAVY

Technical Disclosure Bulletin
Vol. X No. 1 September 1984

Approved for public release, distribution unlimited

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NAVY TECHNICAL DISCLOSURE BULLETIN

Volume 10, Number 1, September 1984

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Johns Hopkins University, APL, Laurel, MD

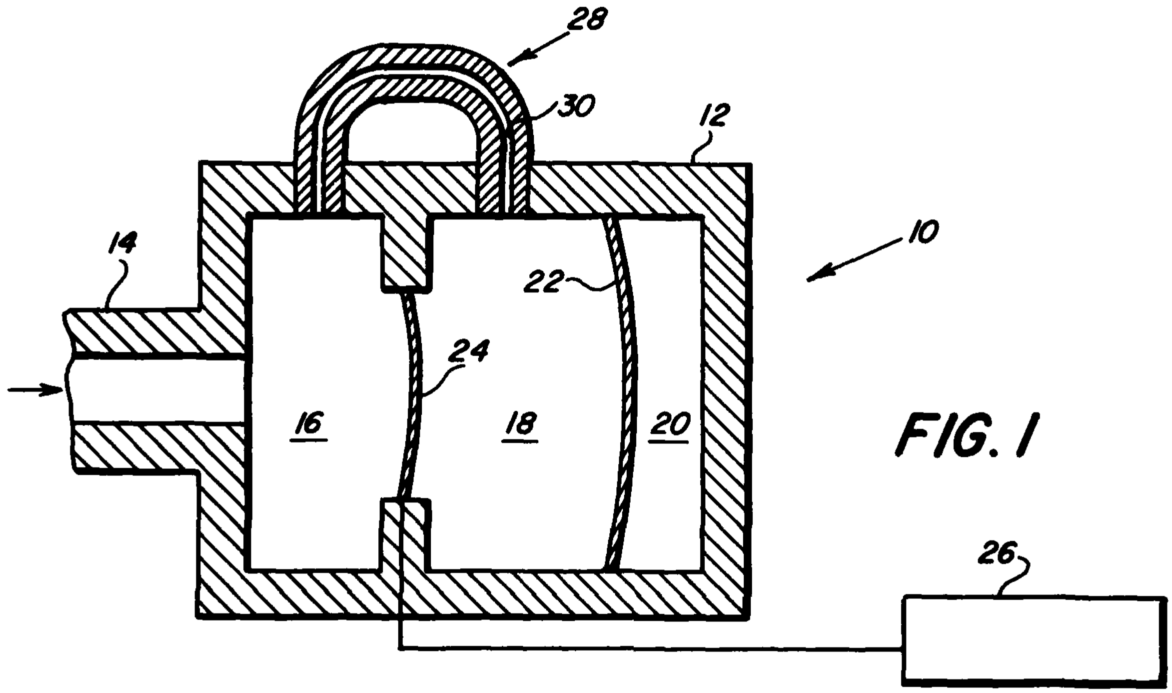

FIG. 1

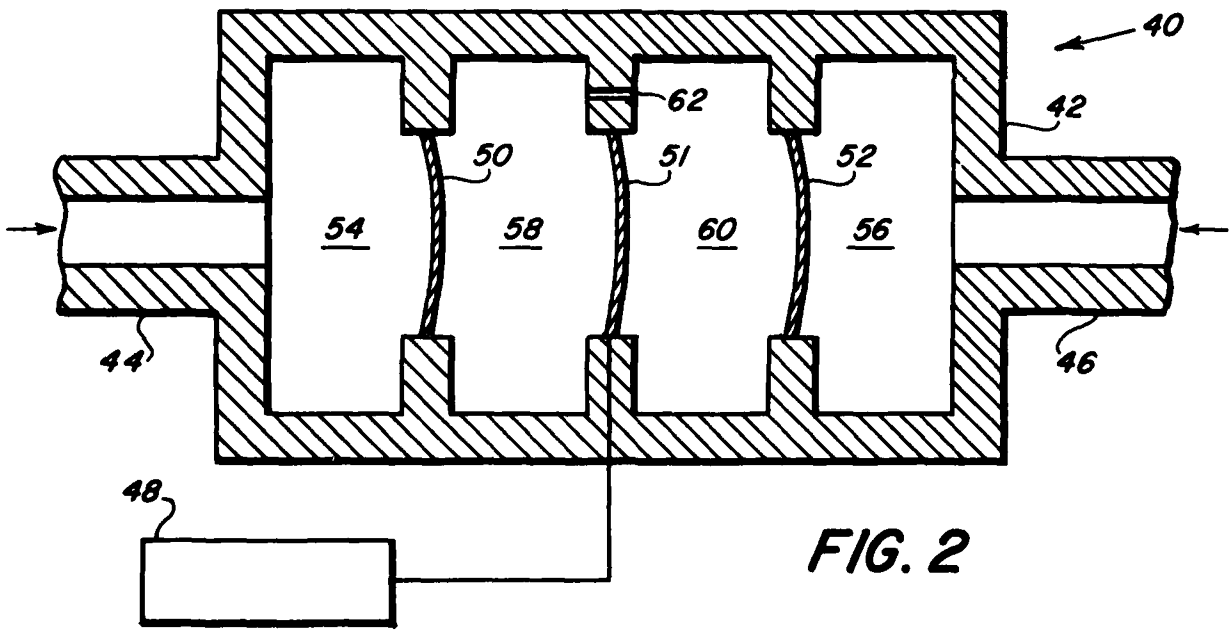

FIG. 2

Navy Tech. Cat. No. 3803 ____ Navy Case No. 65531

HYDROMECHANICAL PRESSURE GAUGE

Allan B. Frazer

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Abstract

A hydromechanical gauge for measuring with high-pass filtration the pressure of an incompressible fluid comprises a housing with a single inlet for admitting the fluid and two flexible partitions that block the fluid flow and devide the interior of the housing into three chambers. The partition further from the inlet has more volumetric compliance than that of the other partition to provide the most ideal functioning. The two chambers nearest the inlet are in communication; so that the pressure in both chambers can equalize. A detector is attached to the partition nearer to the inlet to measure the degree of distention which is a function of the fluid pressure on the partition.

A second embodiment has two inlets and can measure the pressure differential between two fluid flows. This embodiment comprises two inlets, one at each end, and three flexible partitions blocking the fluid flows, thereby providing four chambers inside the housing. The two middle chambers are in communication; so, the pressure of the two chambers can equalize. The two partitions near the inlets are less compliant than the middle partition for better operation. Attached to the middle partition is a detector to measure the degree of distention which is a function of the fluid pressure differential across

the partition.

Description

The subject hydromechanical pressure gauge measures temporal fluctuation of fluid pressure without measuring the mean pressure by measuring the deformation of a mechanical member in contact with the fluid. The full dynamic range of this mechanical member can thus be utilized to measure the fluctuations alone, providing better accuracy in measuring small fluctuations on a large mean pressure. Two devices embodying this technique of measurement are described in the following.

Referring to Figure 1, pressure guage 10 is one such device and includes a housing 12 having an input 14 through which the fluid to be measured enters the housing 12. Typical fluids are hydrocarbon, silicon, or water based fluids. The input 14 opens into an entrance chamber 16. The housing also includes a reference pressure chamber 18 and a void or compliant substance filled chamber 20. The reference pressure chamber 18 and the void chamber 20 are divided by a flexible diaphragm 22. The entrance chamber 16 and the reference pressure chamber 18 are divided by another flexible diaphragm 24. The two diaphragms can be made from any flexible material inert to the fluid used. The flexibility and strength of the diaphragm material are determined by the pressure of the fluid and the desired sensitivity. It is important the volumetric compliance of diaphragm 22 is more than that of diaphragm 24, so that most of pressure

fluctuations are supported by diaphragm 24. Diaphragm 24, while less compliant, would be smaller and arranged to generate relatively large curvatures or linear distensions in response to pressure changes, the sensitivity being proportional to such curvature or distension. The diaphragm 24 is coupled to a suitable detector 26 which can comprise a strain gauge or the like if deflection is being measured to determine the fluid pressure.

A controlled interchamber leak assembly 28 is disposed and operably mounted on the housing 12 to provide a leak passageway 30 between the chambers 16 and 18; so that the pressure in chambers 16 and 18 can be equalized by slow fluid flow through the assembly.

In operation the diaphragm 24 distends as the fluid pressure in the entrance chamber 16 changes, and the diaphragm 22 distends by an equal amount because it is compliant and the working fluid in chambers 16 and 18 has little compressibility. This change in diaphragm 24 is sensed by detector 26. Subsequently, the pressure difference across diaphragm 24 is slowly removed by the action of the force of diaphragm 24 and the leak of passageway 30. Pressure equalization between the chamber 16 and 18 is approached asymptotically. The time constant of this equalization is set by the flow resistance of the passage 30 and the stiffness of the diaphragms 22 and 24. If a pressure change has been applied for a long time, the diaphragm 24 returns to its original position and the diaphragm 22 remains

extended because of the continuing pressure differential across the diaphragm 22. The controlled return of the diaphragm 24 provides the high pass filtration effect. As a result, the gauge 10 reads out peaks which occur over a short period of time, i.e., a time lesser than the time needed by the interchamber leak assembly 28 to provide equalization between the chambers 16 and 18, but does not read out slowly building peaks of pressure. The kinetics of this process are known to be those of a first-order, high-pass filter.

An alternative embodiment of the subject pressure gauge is illustrated in Figure 2 which shows a differential pressure gauge 40. The pressure gauge 40 includes a housing 42 having inlets 44 and 46 connected to two fluid flows. Centrally mounted within the housing 42 is a flexible diaphragm 51 which is operably connected to a deflection detector 48, similar to that of the deflection detector 26 of Figure 1. A pair of flexible diaphragms 50 and 52 are also mounted within the housing 42 and form entrance chambers 54 and 56 and isolation chambers 58 and 60. Chambers 58 and 60 are filled with an incompressible fluid selected for its viscosity and stability.

Diaphragms 50 and 52 have a volumetric compliance not in excess of that of diaphragm 51 for best operation. Disposed between the chambers 58 and 60 is a controlled leak passageway 62 which allows the two chambers to equalize in

pressure. Again the time constant provided by the passageway is determined by flow resistance and diaphragm stiffness.

The differential pressure gauge 40 functions much the same as the pressure gauge 10. The pressure differential between the inlets 44 and 46, as provided to the entrance chambers 54 and 56 respectively, distends the diaphragms 50 and 52 as well as the transducer diaphragm 51. The transducer diaphragm 51 senses the displacement but gradually returns to its initial position as a result of the controlled leak passage 62. Therefore, the controlled leak passage 62 eliminates long term pressure differentials across it.

Advantages and Features

The subject gauges can be easily attached to fluid lines to give temporal fluctuations of fluid pressure without measuring mean pressure. These gauges can accomplish this differential measurement hydromechanically rather than electrically. Therefore, the full dynamic range of a sensitive pressure sensor, being the combination of the sensing diaphragms and the deflection sensors in Figures 1 and 2, can be applied to only the fluctuating part of a large pressure. This method is better than electronically high-pass filtering the signal from a pressure sensor that bears and transduces a large average pressure, as well as its fluctuating components. It is better because the full dynamic range of the device is used for the fluctuations alone, and as such would not be the cause with electronic high pass filtration of the signal from a transducer designed to measure the full static pressure.

GPO 875 423

Navy Tech. Cat. No. 0100, 1531 Navy Case No.65,811

METHOD OF ATTACHING STRANDED ELECTRICAL WIRING

Lloyd E. Vosburgh

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Abstract

A method of preparing stranded wire which enables the wire to be reliably bonded to a surface by spot welding is disclosed. Thermal energy is applied to the end of the wire so that the metal strands becomes soft, flow together, and fuse into a ball because of surface tension effects. The fused ball can be welded to the surface to form a reliable connection.

Description

Frequently stranded wire must make precise electrical contact with a metallic body or substrate at a discrete location along its surface. The electrical connection must also have substantial physical strength and yet introduce no electrical or mechanical faults. A large wire diameter may be required to minimize circuit resistance or to provide the desire current-carrying capability. The bond may also be required to withstand elevated temperatures and severe shock and vibration.

All of the foregoing considerations are satisfied by preparing the stranded wire by heating the ends of the strands until they soften, melt, and flow together to form a ball due to surface tension effects on the molten metal. After the ball has cooled, it can be spot welded to the precise contact point to form a very reliable connection.

The heat is typically applied by a flame such as by a welding torch although equivalent methods of applying thermal energy such as

laser pulsing are suitable. The temperature of the applied thermal energy is not critical as long as the melting point of the wire is reached; however, the heating must be rapid to avoid degrading the insulation of the wire. The diameter of the ball is adjustable by controlling the size of the area of the wire which is heated.

The method of this disclosure has been used to form a ball on 30-gauge, 7-stranded wire for subsequent spot welding to the inside edge of a slip ring assembly on a missile.

Advantages and Features

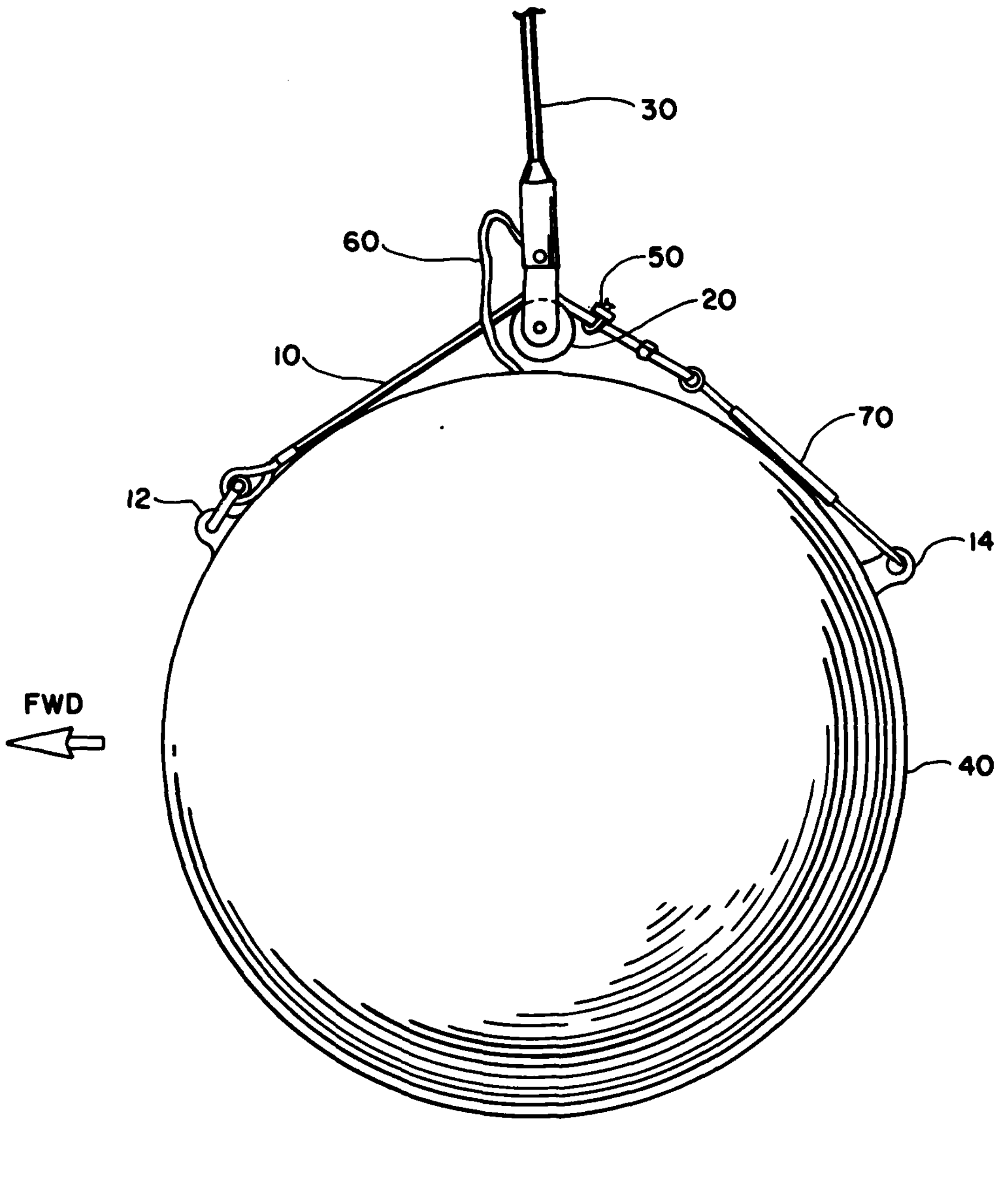
The disclosed method allows the reliable termination of large diameter stranded·wire by spot welding, a well know process. Deleterious bi-metalic effects present in soldering, brazing, and alloying techniques are eliminated and elemental purity is retained in the connection. The flexibility of the wire is maintained and the size of the ball can be controlled for positioning the wire in constricted spaces.

Navy Tech. Cat. No. 6759 Navy Case No. 68048

BRIDLE CONFIGURATION FOR TOWED UNDERWATER VEHICLE

James Appling
Calvin A. Gongwer

Bendix Corporation, Sylmar, CA



Navy Tech. Cat. No. 6759 Navy Case No. 68,048

BRIDLE CONFIGURATION FOR TOWED UNDERWATER VEHICLE

James Appling
Calvin A. Gongwer

Bendix Corporation, Sylmar, California

Abstract

A cable and pulley assembly, which is called a bridle, is attached to the upper portion of a spherical body configuration to be towed underwater. The bridle attachment points are aligned on the centerline of the sphere in the direction in which the sphere is to be towed.

The bridle supports a pulley which is free to reposition itself on the fore and aft cable in response to changes in tow speed. The geometry of the bridle may be adjusted so that the pulley travels along a circle arc centered at the sphere center.

Description

The bridle cable pulley assembly includes a bridle cable 10 that is attached at one end to an eye bolt 12 and to another eye bolt 14 on the centerline of the sphere in the direction in which the sphere is to be towed. Bridle cable 10 supports a pulley assembly 20 attached to a tow cable 30. Pulley 20 is free to move along bridle cable 10 except for the mechanical stop 50 in order to limit the tilt of sphere 40 when pulley 20 moves beyond the vertical centerline, aft position, of the spherical towed body 40.

Bridle 10 is designed to stablize the towed sphere

40 under dynamic conditions of being towed through water. Under all conditions of towing the sphere is totally submerged in water at various depths as required by sonar operation. It is desired to maintain a near vertical position relative to a theoretical centerline of the towed body as this function relates to improved acoustic performance of the device carried in the sphere. The bridle is a flexible track for pulley 20 and as the tow cable angle changes to a change in tow velocity, pulley 20 moves along the bridle 10 in a manner tending to keep sphere 40 vertical.

The geometry of bridle 10 is adjusted so that pulley 20 travels along a circle arc centered at the sphere center, and the distance of pulley 20 from the surface of the sphere being towed is constant as it travels along the bridle 10 to adjust itself for towing speeds. Bridle 10 is adjusted by means of a turnbuckle 70 to provide the proper configuration. This arrangement effectively places the tow point at the center of the sphere 40.

Advantages and Features

The running bridle configuration has improved dynamic control of the body pitch angle under tow speeds ranging from three to six knots. This improvement can readily be seen when the results are compared to performance of a fixed bridle configurations.

Navy Tech. Cat. No. 0734 0185 Navy Case No. 68,138

AIRFIELD RUNWAYS RUBBER REMOVAL SYSTEM

Thomas Novinson

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Abstract

The system involves a method for removing rubber (caused by jet aircraft tire streaks in touchdown zones) from airfield concrete pavements by rapid freezing to embrittle the rubber, followed by mechanical scraping and vacuum cleaning to provide a clean runway.

Description

Civilian and military airfields have a continuous maintenance problem in removing rubber deposits from center line markings or touchdown (approach) areas of runways so that pilots can readily see the landing pattern. Large, highly inflated (250 psi) aircraft tires skid across airfield runway concrete as an aircraft lands, leaving thick, black rubber streaks on the pavement. Eventually the rubber layer becomes thick and hard (but not brittle), obscuring all painted marking lines which are used to guide aircraft to safe landings. Current methods of removing this rubber build-up are slow and expensive, and require two to four days shut down of airfield operations. Methods currently available include water blasting, mechanical grinding, and chemical solvent attack (the last of which is environmentally polluting). Water blasting, the safest method, is not thorough, and there is

always some rubber that remains on the runway. Mechanical grinding is slow and can damage the airfield pavement

The present system involves cooling the rubber deposits down to below its glass transition temperature (t_g) where the rubber becomes brittle and loses adhesion to the concrete pavement. At this point the brittle rubber can easily be mechanically scraped from the runway pavement and brushed off the airfield, or it can be washed off with water, using less energy than earlier methods. The removed rubber can then be swept away or vacuumed up for disposal.

Carbon dioxide is sprayed on as a "snow", shot out as pellets, or used in the form of a solid block of dry ice which is moved over the areas of pavement having a build-up of rubber deposits. Liquid nitrogen, helium or other cold, condensed liquids from room temperature gases (excluding such gases as hydrogen, oxygen and carbon monoxide) can be used for this purpose. The freezing of the rubber will destroy its adhesion to the concrete pavement.

This system can be packaged in mechanical equipment using environmentally clean dry ice (i.e., frozen carbon dioxide) or liquid nitrogen, etc., which is passed over areas of rubber deposits until the rubber becomes brittle. Mechanical scrapers, brushes and a vacuum system can be included in the device to immediately scrape and remove the loosened rubber. A vehicle similar to a street sweeping machine can incorporate all the necessary equipment to freeze the rubber

deposits as it passes over areas of an airfiled runway pavement, and to scrape, brush, and vacuum away the loosened rubber. If desired, water washing and vacuuming can be incorporated into the device using well-known state-of-the-art techniques.

Advantages and Features

Unlike simple water blasting, which does not remove all the rubber deposits, the freezing of rubber destroys its adhesion to concrete and allows for its easy removal. This method, unlike mechanical grinding, does not harm the airfield runway pavement. Also, unlike the use of chemical solvents, there are no hazardous by-products or problems causing environmental pollution.

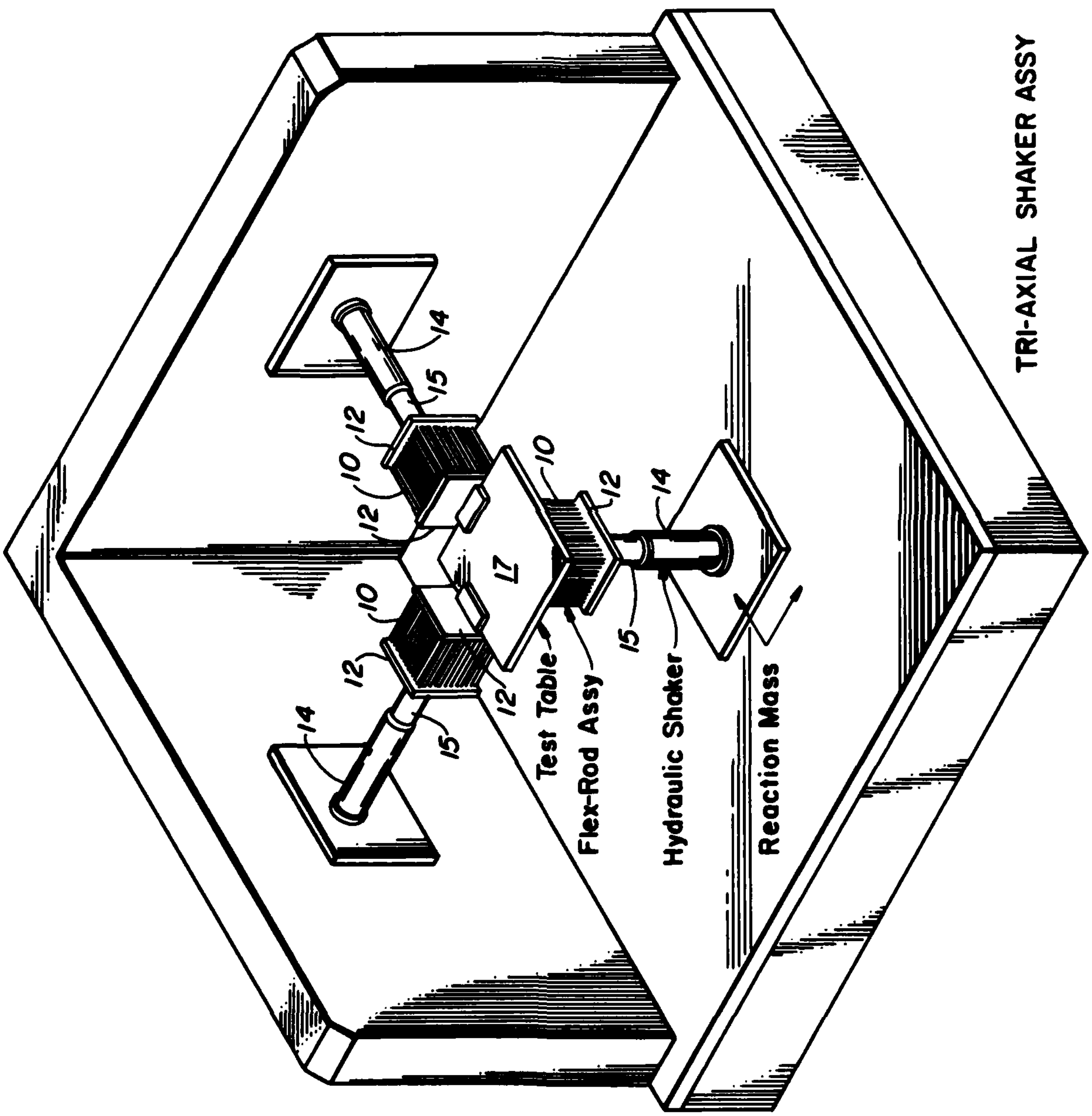
Navy Tech. Cat. No. 3801

Navy Case No. 68184

FLEXIBLE DRIVE ROD SYSTEM FOR THREE AXIS VIBRATOR

William D. Everett

Pacific Missile Test Center, Point Mugu, CA



TRI-AXIAL SHAKER ASSY

Navy Tech. Cat. No. 3801 Navy Case No. 68,184

FLEXIBLE DRIVE ROD SYSTEM FOR THREE AXIS VIBRATOR

William D. Everett

Pacific Missile Test Center (PMTC), Point Mugu, California

Abstract

A flexible drive rod assembly enables three mutually perpendicular shakers to vibrate a specimen. The drive rod assembly is a bundle of many thin, flexible, rods which are rigid when driven axially but compliant to motions in the transverse directions. Thus, each of the three shakers driving through such an assembly can input their force and, at the same time, tolerate the motions from the other two.

Description

It is well known that shock or vibration excitations are three dimensional in nature, but these effects cannot be totally simulated using existing test equipment. More realistic shock and vibration tests lead to more reliable equipment. The purpose of the flexible drive rod system is to allow three mutually perpendicular shaker forces to simultaneously drive a test table and specimen. There have been several prior attempts to mechanize a three axis shaker system without much success. Typically, three mutually perpendicular shakers drive through some sort of slip plane normal to their drive axis. Theoretically, this technique should isolate each shaker from the cross axis motions generated by the other two shakers. However, the slip joints tend to weaken and distort the shaker thrusting

force and the resultant assembly becomes cumbersome and prone to extraneous resonant motions. Additionally, the hardware involved in prior efforts has been complex and expensive, therefore, minimizing the number of attempts. The present device, however, makes tri-axial vibration testing a practical reality, and allows realistic simulation of the effects of shock and vibration on materiel and equipment.

In the tri-axial shaker assembly shown in the figure of drawing, the drive rods 10 are the unique and critical element of the system. Proper functioning of the system requires that each drive rod 10 be rigid in its axial direction and compliant in all other directions. Each drive rod 10 is essentially a bundle of slender flex-rods with a rigidly fixed plate 12 at each end, such as shown, and which can deliver the shaker thrust even when partially bent. Each of the hydraulic shakers 14 has its piston end 15 connected to a plate 12 at one end of a respective drive rod 10. The plates 12 at the other ends of the three drive rods 10 are connected to and/or bear against the bottom and two sides, respectively, of a test table 17, for example, such as shown in the drawing.

A typical rod design for an hydraulic shaker assembly would be a bundle of 1/16 inch diameter spring steel rods with a 10 inch free length which are rigidly fixed at each end by plates 12. About 5000 of such flex-rods are used in each of the three axial directions, bundled into three

groups of approximately 1700 each and located to resist pitching moments from the test table 17. Design calculations and experiments show that this rod design is compatable with hydraulic shaker capabilities, with a buckling strength 10 times the shaker force and no resonance below 200 Hz. The rod assembly can be adapted to each specific application, with more rods being used when higher forces are required and thinner, shorter rods used when less stroke but higher frequencies are required.

Advantages and Features

The flexible drive rods are a simpler, cheaper mechanism for enabling a realistic three-axis shaker system. The drive rods are rigid in the axial direction and compliant in all other directions. Since they form a solid metal connection between the hydraulic shakers and the test table, the drive rods yield improved fidelity in the transmitted motion to provide realistic simulation of the effects of shock and vibration on materiel and equipment.

Navy Tech. Cat. No. 3802 Navy Case No. 68336

TRANSIENT SOURCE DETECTOR FOR A THREE-PHASE SYSTEM

Kwang-Ta Huang

Naval Civil Engineering Laboratory, Port Hueneme, CA

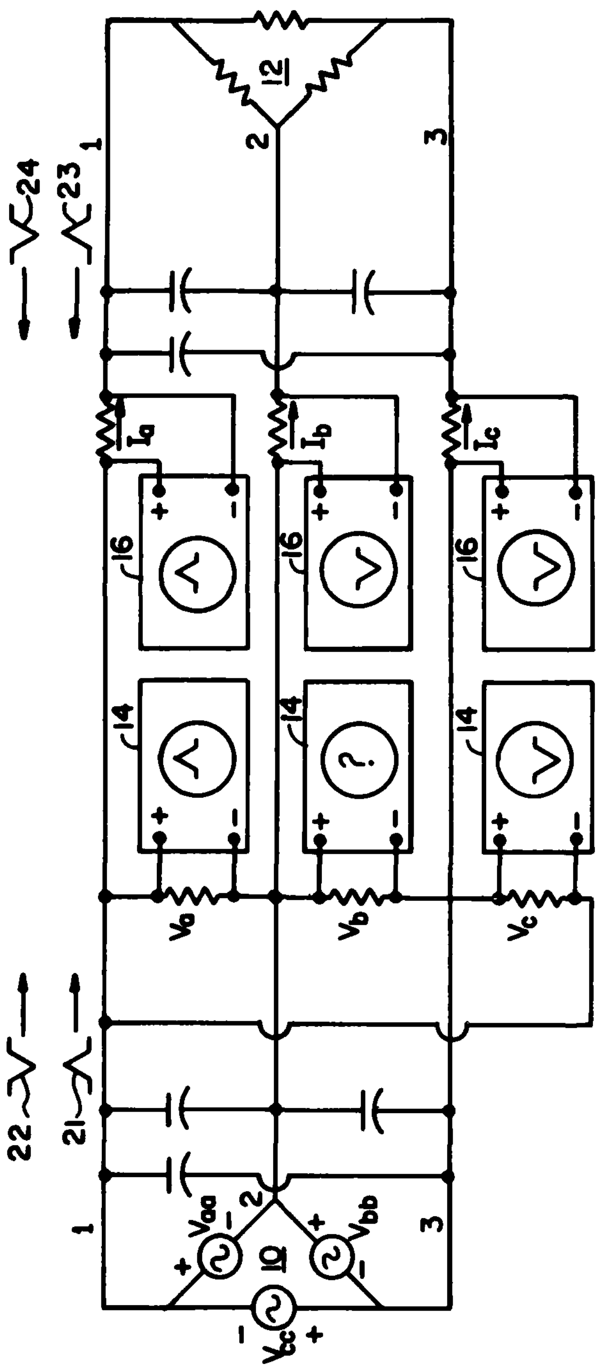


FIG. 1

TRANSIENT SOURCE DETECTOR FOR A THREE-PHASE SYSTEM

Kwang-Ta Huang

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Transient	Voltage Polarity Sensor	Current Polarity Sensor	V_i I_i Product Polarity	Majority Sign	Transient Origin	Transient Polarity
21	V_a + V_b V_c −	I_a + I_b − I_c	$V_a I_a$ + $V_b I_b$ $V_c I_c$	+	Generator	+
22	V_a − V_b V_c +	I_a − I_b + I_c	$V_a I_a$ + $V_b I_b$ $V_c I_c$	+	Generator	−
23	V_a + V_b V_c −	I_a − I_b + I_c	$V_a I_a$ − $V_b I_b$ $V_c I_c$	−	Load	+
24	V_a − V_b V_c +	I_a + I_b − I_c	$V_a I_a$ − $V_b I_b$ $V_c I_c$	−	Load	−

FIG. 2

Navy Tech. Cat. No. 3802 ____ Navy Case No. 68,336

TRANSIENT SOURCE DETECTOR FOR A THREE-PHASE SYSTEM

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Abstract

In a three-phase system, detectors are provided for each phase to detect current, current direction, voltage and voltage polarity. The polarity of the $V_i I_i$ product is also detected for each phase. By reading the sign of these three quantities, the source of the transient is determined. A majority of positive polarities indicates that the transient source is from the generator. A majority of negative polarities indicates that the transient source is from the load.

Description

Fig. 1 shows a schematic diagram of the system. A three-phase generator 10 provides power for a three-phase load 12. Connected across each phase is a voltage and polarity detector 14. Connected to each phase is a current and current direction detector 16.

The detector circuits may be divided into four major sections: power supply; voltage and current sensing; and logic and control. Each detector has its own DC power supply, which may be derived through a voltage probe connected to one phase of the AC source. At the input to the voltage section, the three voltage probes should be marked

L_1 and L_2 for one probe, L_2 and L_3 for the second probe and L_3 and L_1 for the third probe. Each voltage probe also has a ground lead. One side of each current probe should be marked "S" for source and the other side "L" for load. The three current probes must be marked L_1, L_2 and L_3 for lines 1, 2 and 3, respectively.

Other parts of the detector are direction and polarity visual indicating lights and reset circuitry. The logic section of the detector circuit activates the appropriate direction-indicating and polarity lights. The control circuit controls the time that the input signals from the current and voltage sections are allowed to enter the logic section.

The operation of the system is explained by hypothetically substituting six resistors for the transformer as shown in Fig. 1. There are shown four possible transients that may occur on a powerline by waveforms 21, 22, 23 and 24. The oscilloscope traces shown in Fig. 1 are for the transient 21.

The voltage and current polarities sensed by the probes are listed in the table of Fig. 2, along with the polarity of their product (V_iI_i). For any one transient, if the majority of these product signs (i.e., two out of three) are plus, the origin of the transient is at the generator 10. If the majority of these product signs are negative, the origin of the transient is near the load 12. Logic systems

are used to determine the product polarities and to determine the sign of the majority of the products.

The transient polarity is determined from the output of a logic system whose inputs are the six polarities of the voltage and current sensors. The question mark in Fig. 1 indicates that one of the six inputs to the logic system will be a don't-care logic variable. The other five inputs are sufficient to determine the transient polarity. Capacitors are connected in parallel with each of the loads to insure the detection of current direction with high-impedance loads.

Advantages and Features

The described detector can indicate the polarity and give the direction of the origin of a transient on a three-phase system. As illustrated in the table of Fig. 2, the majority sign of $V_i I_i$ is used to determine the direction of the origin of the transient. The detector can be used to determine whether or not a transient occurred on a powerline, the direction of the origin of the transient, and the polarity of the transient.

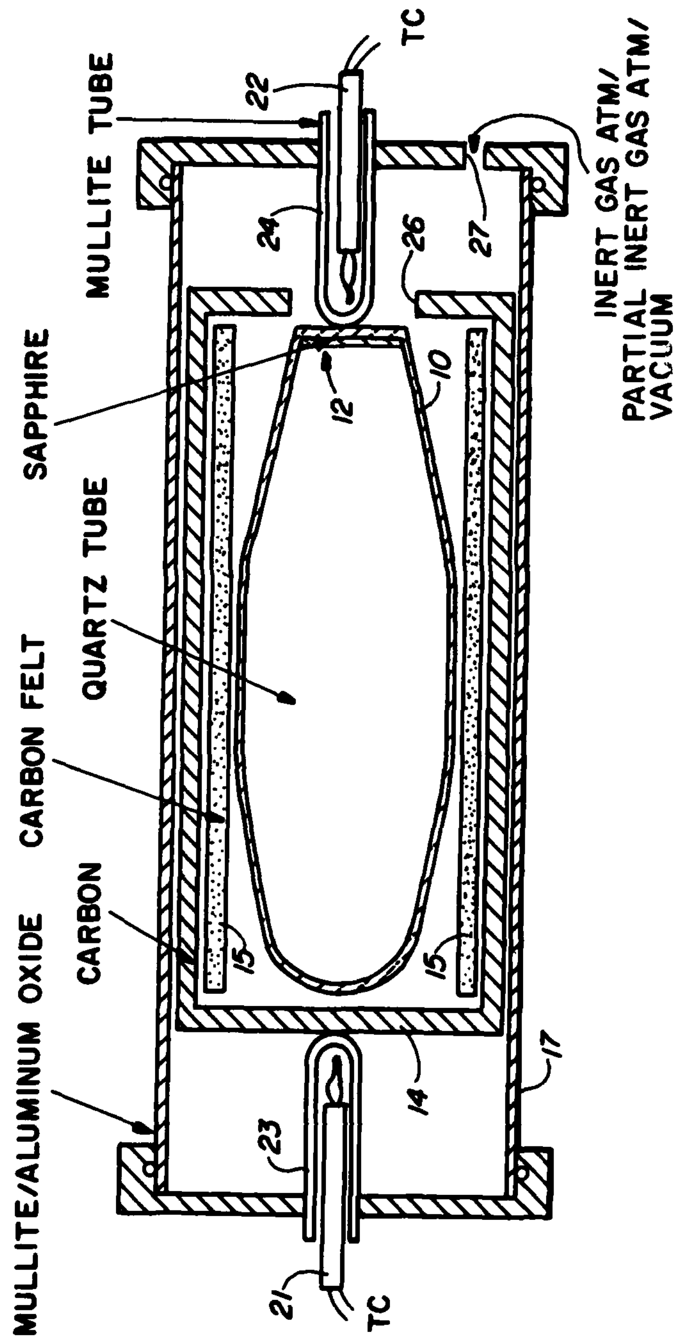
GPO 878 423

Navy Tech. Cat. No. 1163 — Navy Case No. 68486

METHOD OF PREVENTING DEVITRIFICATION OF SILICA DURING CRYSTAL GROWTH

Nanse R. Kyle

Hughes Aircraft Co., El Segundo, CA



Navy Tech. Cat. No. 1163 ____ Navy Case No. 68,486

METHOD OF PREVENTING DEVITRIFICATION OF SILICA DURING CRYSTAL GROWTH

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Hughes Aircraft Company, El Segundo, CA

Abstract

Devitrification of silica (quartz) during crystal growth at high temperature (>1140°C) can be prevented by protecting the silica with an inert gas such as nitrogen or in a partial pressure of an inert gas.

Description

Silica (quartz) is commonly used as a container for crystal growth. At high temperature, devitrification in the atmosphere is an inherent property of silica which results in silica losing its elasticity and mechanical strength. The elasticity and mechanical strength can be maintained if the silica is protected so that devitrification cannot take place.

A previous method for forestalling devitrification was by cleaning the surface of the silica container. A typical procedure involved cleaning the silica container surface with a wash of 10% hydrofluoric acid for several minutes at room temperature, followed by a series of rinses in distilled or deionized water, and then drying the silica container as rapidly as possible. After such a procedure the silica (assuming it is of at least 2mm wall thickness) would last approximately two days at 1300°C.

The new method makes it possible to operate silica at temperatures in the order of 1300°C for a month or more without the silica losing the properties that make it such a valuable container material for crystal growth at high temperatures. Previously, no concerted effort had been made to prevent devitrification of silica. The devitrification was assumed to be inevitable; therefore, compensation was made by using the silica for short periods of time and making the container walls thick.

The present method for crystal growth at high temperature uses a system as schematically represented in the figure of drawing. As shown, a silica (quartz) tube 10, which contains a sapphire crystal 12 to be grown, is located within an inner chamber 14 of carbon. A layer of carbon felt 15 surrounds the quartz tube 10. The carbon chamber 14, in turn, is housed within an outer chamber 17 of mullite/aluminum oxide. Thermostat controls 21 and 22 monitor the temperature of the carbon chamber 14 and the quartz tube 10, respectively. The thermostat controls 21 and 22 are respectively housed within protective mullite tubes 23 and 24. The system is heated within a controlled furnace.

An inert gas atmosphere is provided within the inner chamber 14 and outer chamber 17 via ports 26 and 27. Nitrogen, or any other inert gas is suitable. If the quartz tube 10 has an internal pressure, e.g., includes encapsulated materials which would cause it to expand, a partial

GPO 878 423

pressure of N_2 is used to equalize the internal pressure to stop expansion. If the tube 10 may tend to collapse because of lack of internal pressure, then a vacuum environment is used in the chambers.

Advantages and Features

This sytem would be important in any process that has had difficulty in maintaining the integrity of silica (quartz) over a long period of time at high temperatures.

It is possible to run this system for crystal growth at high temperature at least to 1300°C and 30 days without the silica tube losing its elasticity and mechanical strength due to devitrification. An inert gas atmosphere, or a partial inert gas atmosphere, or a vacuum can be used as the situation requires.

Navy Tech. Cat. Nos. 1531, 4266 — Navy Case No. 67944

HYBRID TEST CONNECTOR

David L. Rosen

Westinghouse Electric Corp., Baltimore, MD

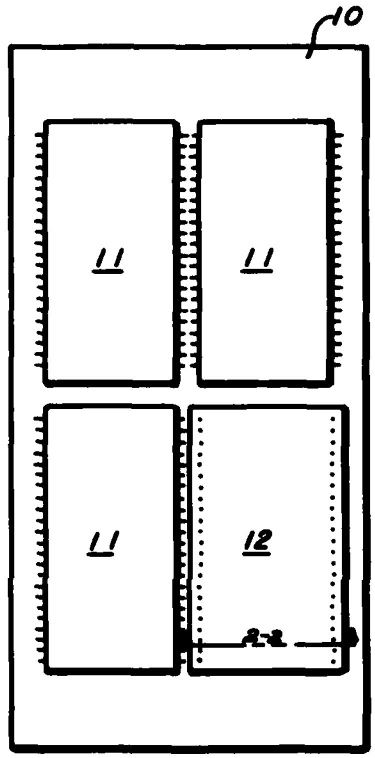

FIG. 1

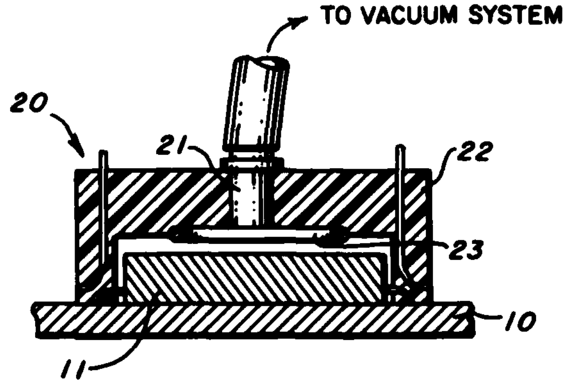

FIG. 4

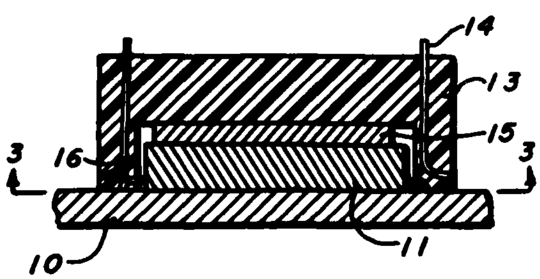

FIG. 2

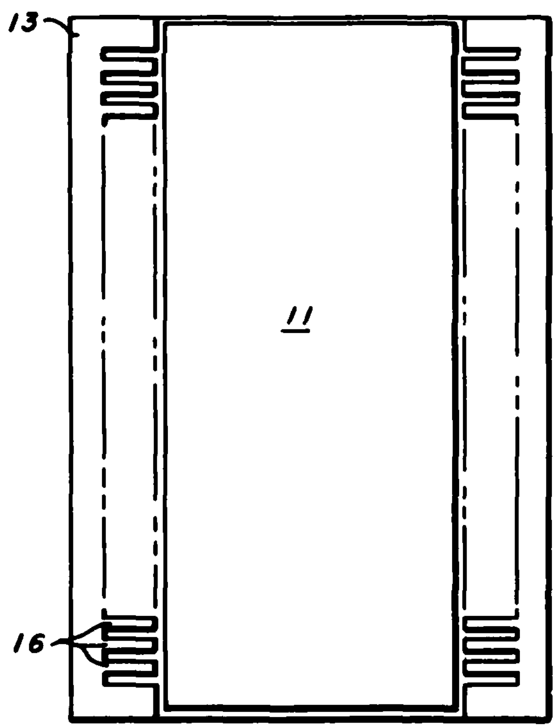

FIG. 3

HYBRID TEST CONNECTOR

David L. Rosen

Westinghouse Electric Corp., Baltimore, MD

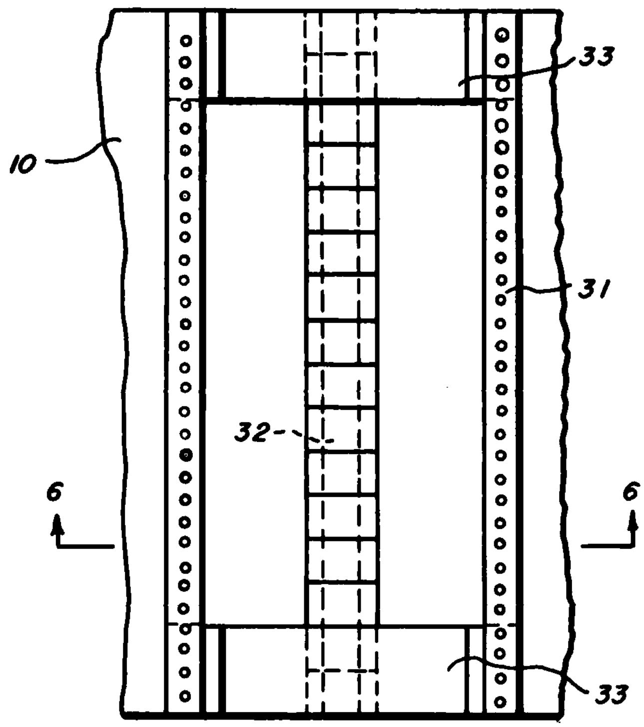

FIG. 5

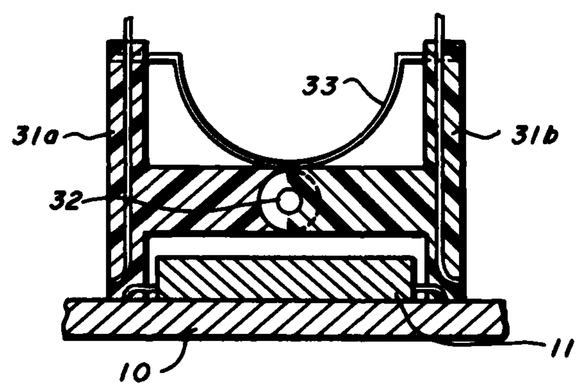

FIG. 6

Navy Tech. Cat. No. 1531 4266 Navy Case No.67944

HYBRID TEST CONNECTOR

David L. Rosen

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Abstract

Disclosed is a multipin connector for monitoring in situ input and output signals of components included in electronic circuitry. Adapted to conform to component size and contact spacing, the connector is attached to the component to be tested by a double-faced replaceable tape system, vacuum system, or a clamping mechanism grabbing the component on its leaded sides.

Description

In the course of integrating electronic system hardware and testing system software, it may be necessary at times to monitor input and output signals down to the component level. Traditionally, this monitoring function has been accomplished by using clip-on or pointed tip probes. However, as component size or interlead spacing decreases, the probability of making multiple, simultaneous measurements without shorting adjacent leads also decreases. This is particularly true in the dynamic, in-circuit testing of multi-chip hybrid packages (MHP) when these devices are placed on printed circuit boards such

that their end to end spacing and mounting pad distances approach zero.

FIG. 1 shows in top view a hybrid test connector 12 mounted on a circuit board 10 and employing a double-faced replaceable tape attachment system to test electronic component 11. Shown in enlarged detail in FIG. 2, connector body 13, fabricated from fiber reinforced plastic by means of injection molding techniques, is sized to accommodate the same number of contacts and contact spacing as the component to be tested. Removable copper alloy contacts 14 are placed in their respective slots and terminate on the upper side of body 13.

In use, a piece of doubled-faced tape 15 or equivalent is adhered to the underside of body 13 in the area between the contact rows. Connector 12, tape side down, is aligned with component 11 along their non-leaded edges, and pressed down over component contacts 16. FIG. 3 shows the underside view of hybrid-test connector 12 with contacts 16.

FIG. 4, in section view, shows a second embodiment of the hybrid test connector, generally designated 20, for use in a vacuum attachment system. Similar in size and construction to connector 12, connector 20 further includes vacuum line port 21, extending through connector body 22 and adapted to be used with any conventional vacuum system.

In order to provide a vacuum seal, gasket 23 is fitted into a groove about the periphery of the underside of body 22 in the area between the contact rows. It should be noted that to accommodate gasket 23, the legs of body 22 will of necessity be longer than those of body 13.

Still another embodiment of the hybrid test connector is shown, in section and plan view, in FIGS. 5 and 6. Generally designated 30, this connector is similar in most respects to connector 12, but consists of a two-piece body 31a and 31b hinged together by pin 32 and held in its operative position by springs 33 which are connected to respective sides of body 31.

Advantages and Features

Thus, it is apparent that a hybrid test connector as disclosed will avoid the problems associated with conventional test connectors such as "dip chips". A multipin connector of similar size to the component to be tested and attached thereon makes electrical contact with all leads simultaneously and eliminates potential device damage due to high clamping forces. Furthermore, poor contact or adjacent lead shorting is eliminated by effectively removing connector size as a constraint. Test probes, soldered, or buffered connections can now be easily made between the hybrid test connector and associated test equipment.

GPO 875 423

Navy Tech. Cat. No. 7460 Navy Case No. 66931

PHOTOCHROMIC FIELD EFFECT TRANSISTOR

Forrest L. Carter

Naval Research Laboratory, Washington, DC

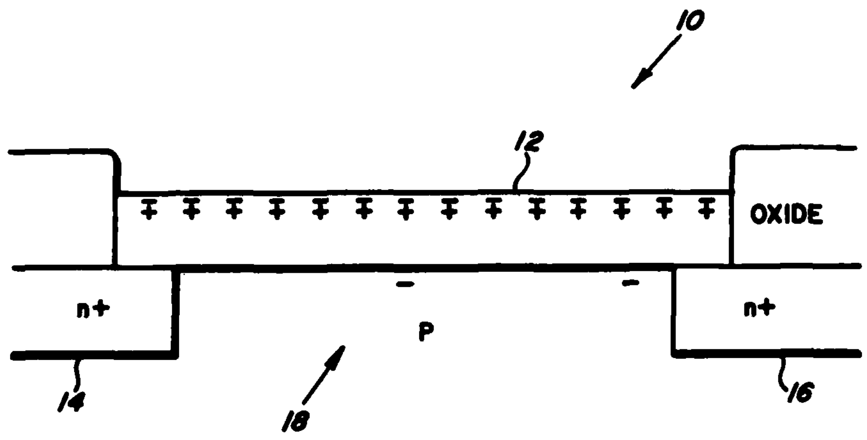

FIG. 1(a)

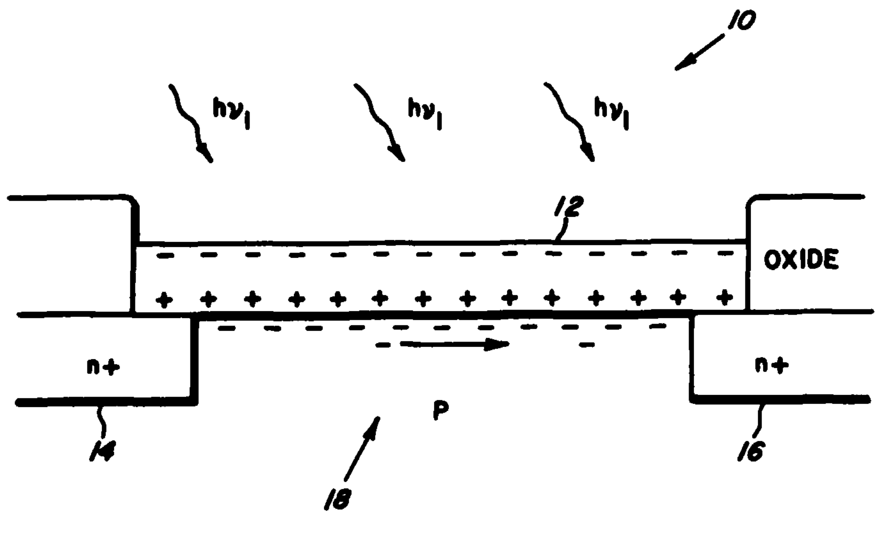

FIG. 1(b)

Navy Tech. Cat. No. 7460 Navy Case No. 66931

PHOTOCHROMIC FIELD EFFECT TRANSISTOR

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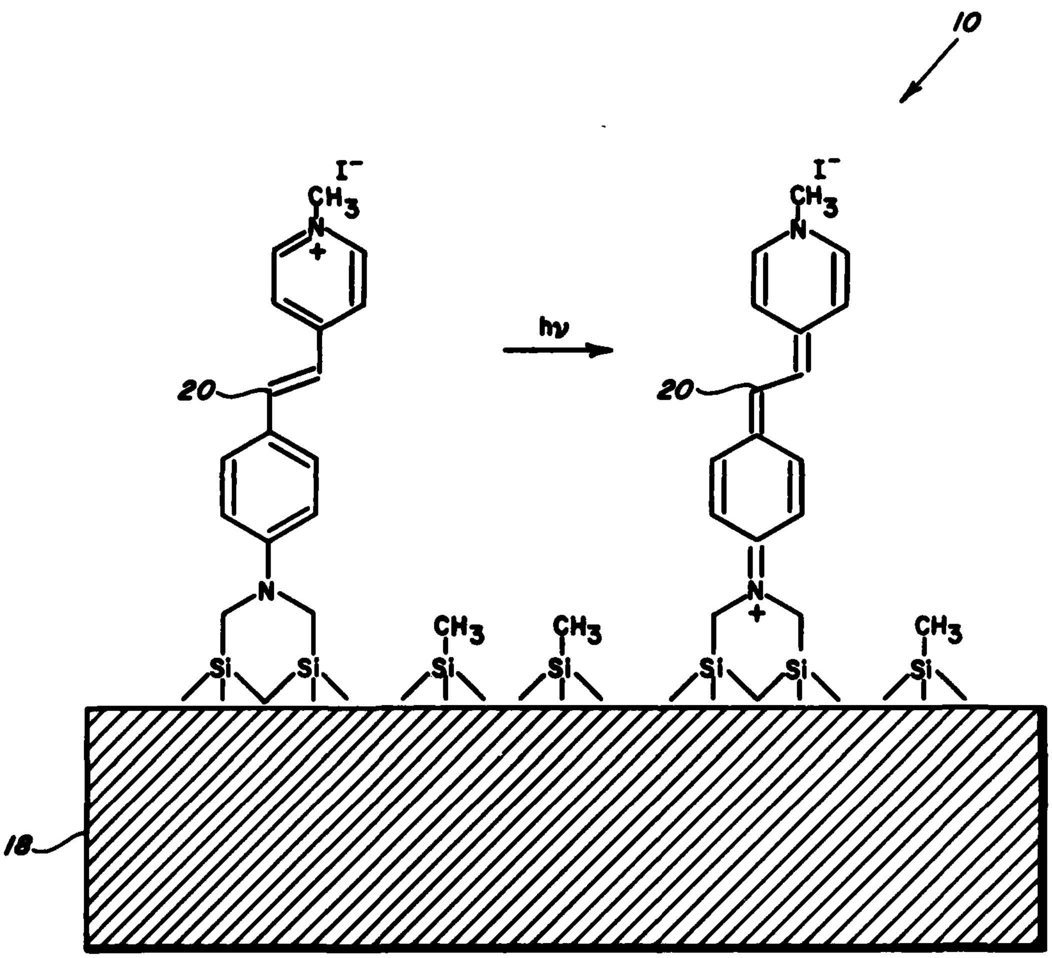

FIG. 2

Navy Tech. Cat. No. 7460 ____ Navy Case No. 66,931

PHOTOCHROMIC FIELD EFFECT TRANSISTOR

Forrest L. Carter

Naval Research Laboratory, Washington, D.C.

Abstract

An FET (field effect transistor) structure in which a monolayer of photochromic molecules replaces the usual gate electrode. The molecules are directly bonded to the silicon substrate with silane or alkyloxy-silane derivatives. When light is directed onto the photochromic layer it produces an electric dipole which can switch the conduction state of the FET in the order of picoseconds. Many photochromes are currently available and can be color selective. There results a small fast photodetector which can be made in a large array.

Description

Current methods of photoactivation usually involve a photocell or photodiode to control the gate voltage on a transistor. The limitations of the old methods include: 1) a much larger size, 2) a much slower response time, 3) larger power consumption, 4) a large number of component interconnects and 5) complexity. Another disadvantage can be the non-selectivity of the old photodetection system in regards to wavelength.

The photoactivated FET-type gate described herein is a combination of current advanced technology and molecular surface modification chemistry. The usual metal gate

structure of the FET is replaced by attaching special chromophores directly to nascent silicon at the gate location. In operating mode the device is turned on by the dipole field generated by photoactivated chromophores at the gate surface.

Essentially, the detection scheme is a photochromic layer of molecules chemically surface bonded to the gate area of a field effect transistor (FET). These photochromic molecules are bonded directly to the nascent silicon surface of the gate so that when photoactivated they provide a dipole field which activates the transistor.

Figures 1a and 1b are blowups of the FET gate 10 with a monomolecular layer 12 replacing the metal gate and its insulation. In Fig. 1a, without photoactivation, the dipole field is very small and very few electrons pass between source 14 and drain 16.

As shown in Fig. 1b, photo-excitation of the chromophores generates a large dipole field which is situated such that electrons are attracted into a small silicon volume of silicon substrate 18 beneath the gate surface while holes are excluded, thereby creating an n-channel inversion layer and permitting electrons to flow from the source to the drain. The theoretically predicted charge and conformational changes during molecular excitation of single photochrome 20 on FET 10 are indicated in Fig. 2. The CH_3Si- groups on the silicon surface help eliminate surface states.

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Navy Tech. Cat. No. 7460 ____ Navy Case No. 66,931

The magnitude and range of the dipole fields for a single chromophore in the ground state (Case A) and excited state (Case B) are indicated in Table 1. In the calculation it has been assumed that the counter anion is stationary and 15A above, the surface of silicon substrate 18 and that the positive charge is movable upon excitation (as in Fig. 2). In the ground state the positive charge is located 12 angstroms from the surface of silicon substrate 18 so that charge separation is d = 3 angstroms. In the excited state the charge separation increases to d = 15 angstroms with the charge at or very near the surface of silicon substrate 18. The electric field has been calculated for three distances into the silicon, i.e., 10, 50 and 100 angstroms. First, it is seen that the dipole fields are quite large, espec.. ly near the surface and that the ratio of the fields for the photoactivated/ground state range from 18 to 6 for the three distances. The dipole field generated produces a rather narrow n-channel at the surface of silicon substrate 18. An estimate of the relative importance of these dipole fields can be seen by comparison with the fields generated by the metal electrode in a normal MOS-FET of about 2×10^4 volts/cm. The numbers in Table 1 are influenced by three factors. The fields would be reduced by the dielectric constant of silicon and the movement of electrons into the n-channel, and would be increased by the present of other excited chromophores.

Table 1

Dipole Electric Field Strengths

	Case A, d = 3 Å, Ground State	Case B, d = 15 Å, Photoactivated	B/A Ratio
10 Å	6.71×10^{5} volts/cm	121.0×10^{5} volts/cm	18
50 Å	3.4×10^{4}	23.5×10^{4}	6.9
100 Å	5.9×10^{3}	35.0×10^{3}	5.9

Assuming a chromophore as in Fig. 2 packed at van der Wall distance, the maximum density of chromophores possible is as much as $4.5 \times 10^{14}/cm^{2}$. Such a packing can be achieved by a Langmuir-Blodgett technique. Nevertheless, such a high density is undoubtedly not necessary, as electron tunnelling through local potential barriers can play an important role. The chromophores can also be attached to the base silicon surface by a variety of silane or alkyloxysilane derivatives, employing techniques known in the art. Unwanted surface states must be avoided by appropriate surface modification chemistry as in Fig. 2.

The photochrome moieties can be varied over a very wide range, i.e., from transition metal mixed valence compounds to organic dyes. Other rigid photochromes whose length, relaxation time charge, and effective wavelength can be appreciably controlled by choice of the organic radicals attached. In the design of organic photochromes, the groups with movable charges can include $\equiv N^{+}$, $\equiv P^{+}$, $\equiv S^{+}$, $\equiv O^{+}$, $\equiv C^{+}$,

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$-S^-$, $-O^-$, and $-NO_2^{-2}$. Furthermore, the FET fabrication material need not be composed of only Si material but could be others such as Ge, SiC, GaAs or variations of these.

Advantages and Features

State-of-the-art FETs can have gate areas as small as 1 square micrometer. Approximately 250,000 photoFETS could be placed on a square millimeter. Hence, optical resolution is comparable to many diode arrays. Additionally, by choice of the photochrome, the FET switch can be made sensitive to selected optical wavelengths. Therefore an array of photoFETs such as described above could be responsive to several different colors by employing different photochromes on a selection of the array elements. Furthermore, since optical absorption is very fast, less than 10^{-15} sec, the response time will be limited by other processes, primarily the residence time of the electron under the FET gate area, and the response time of the circuit. Moreover, large arrays of photoFETs constructed as described in this disclosure are far simpler than present equivalent systems employing a plurality of photodiodes connected individually to switches.

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Tech. Cat. No. 7404

Navy Case No. 67992

WEDGE STABILIZATION PEDESTAL

James W. Titus

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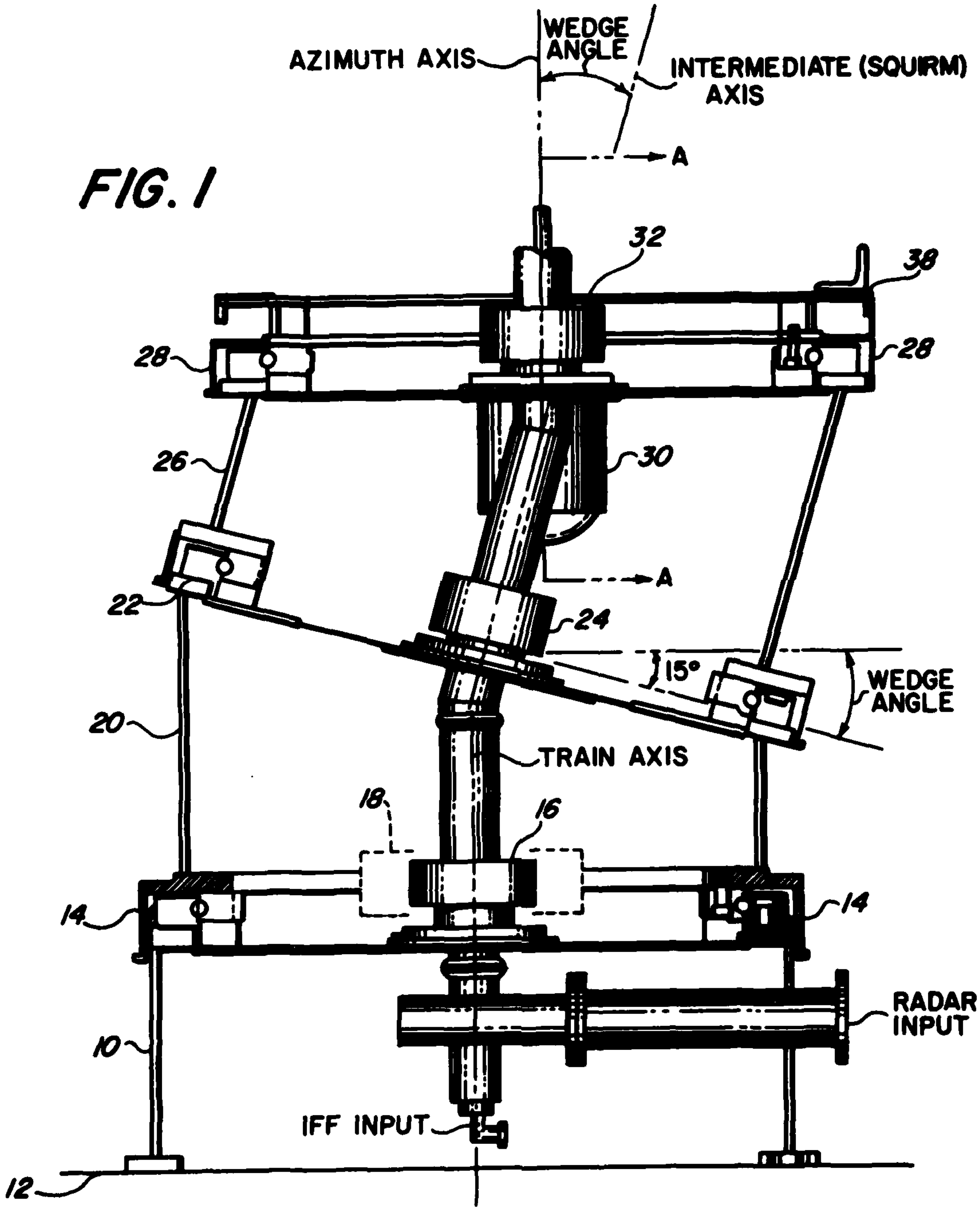
FIG. 1



RADAR PEDESTAL WITH WEDGE STABILIZATION

Tech. Cat. No. 7404 Navy Case No. 67992

WEDGE STABILIZATION PEDESTAL

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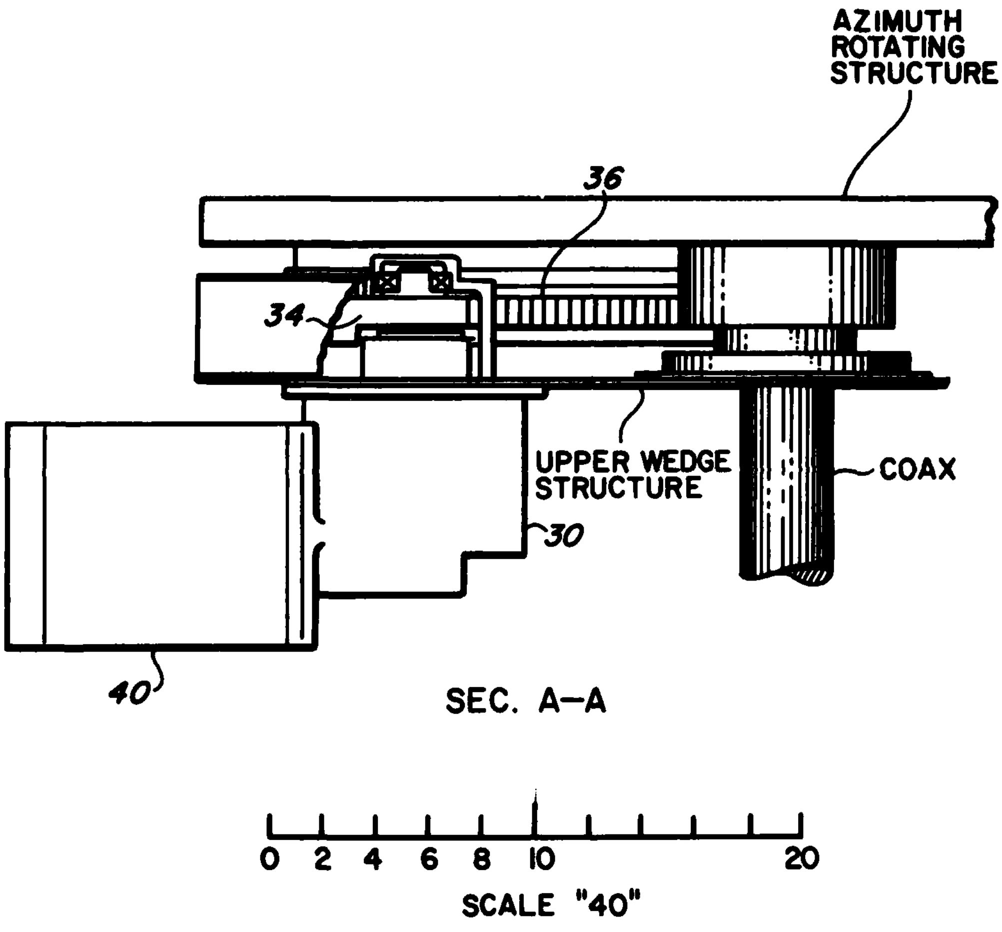

AZIMUTH DRIVE

FIG. 2

Navy Tech. Cat. No. 7404 ____ Navy Case No.67,992

WEDGE STABILIZATION PEDESTAL

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Abstract

A mounting system for mounting ship radar antennas or other equipment that functions to correct for deck tilt. The mounting system comprises a lower wedge which includes a support member having a train axis, the lower wedge being mounted for rotary movement in respect to a base; an upper wedge which includes a support member having a squirm axis, the upper wedge being rotatably mounted on top of the lower wedge such that the train axis forms a certain wedge angle with the squirm axis; and a mounting plate, on which the antenna or equipment may be mounted, rotatably mounted on top of the upper wedge, the mounting plate having an azimuth axis which forms an angle equal to the wedge with respect to the squirm axis. The angular relation between the azimuth axis and the train axis may be changed by adjusting the rotation of the wedges and the mounting plate. If an elevation axis is included, the system becomes suitable for aircraft and satellite tracking systems.

Description

The wedge-stabilization pedestal is a three-axis configuration which provides a fully-stabilized azimuth scan for any combination of ships roll and pitch within the design limits. The axis used are a (1) train axis

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fixed with respect to the deck, (2) an intermediate axis which intersects the train axis at the fixed angle, the "wedge angle", and (3) a third axis which is to be maintained truly vertical, by appropriate rotations about the first two axis, thus making it the azimuth axis.

The principal parts are shown in the layout, Figure 1. A base 10 mounted on a ship's structure 12, supports a train axis bearing 14 and provides room for the train drive elements (not shown), a train axis rotary joint 16, slip rings 18, etc. The train axis is shown perpendicular to the deck, but it may be canted at a fixed angle other than 50°. The lower wedge 20 rotates on the train bearing 14 and supports a canted intermediate bearing 22, thus establishing the intermediate axis. The lower wedge 20 also supports and provides space for the intermediate drive motors and bear boxes (not shown), intermediate rotary joints 24, slip rings (not shown), data unit (not shown), etc. This intermediate axis may be termed the "squirm axis", since there is no established name.

The intermediate drive motors rotate an upper wedge 26 about the squirm axis. The upper wedge 26 in turn supports an upper bearing 28 (which is azimuth), and azimuth drive motors 16 with gear boxes 30, azimuth rotary joints 36, slip rings (not shown), date unit (not shown), etc. The upper wedge 26 is constructed so that the azimuth axis intersects the squirm axis at the same angle as that angle between

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the train axis and the squirm axis. An azimuth mounting plate 38 is located on an azimuth bearings 28.

With this construction, the squirm drive can be operated to control the magnitude of the angle between the azimuth axis and the train axis. The train drive can be operated to align the tilt produced by this operation of the squirm drive in a way to cancel the tilt of the deck. Thus the azimuth axis may be kept vertical for any deck tilt from zero to twice the wedge angle.

Figure 2 is a cross-section showing one of the azimuth motors 40 with gear box 30 and pinion 34 meahing with the azimuth bull gear 36. A pair of such drive assemblies would be provided for each axis. These would differ in motor size according to the different requirements.

An elevation axis can be added over the azimuth axis. The pedestal system then becomes suitable for tracking systems, including, but not limited to satellite communications, and radar tracking of aircraft.

Advantages and Features

The use of a pair of wedges so arranged, by means of bearings and drive systems, that their motion relative to one another (squirm) varies the angle between the upper axis (azimuth) and the lower axis (train) and wherein their common motion (train) directs this angle so as to compensate exactly for the tilt of the deck, that is, to stabilize the azimuth axis. The mounting system's train axis and squirm

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axis may rotate continuously without interference, eliminating the need for heavy and costly limit stops. The cylindrical shape of the base and wedges contributes to efficient stress distribution, which contributes to weight reduction compared to a gimballed stabilization system. The arrangement can be built to accommodate larger tilt angles than a gimballed system. Unlike a gimballed system, the wedge stabilization pedestal needs no jackscrews or piston actuators, even if built in large sizes.

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Navy Tech. Cat. No. 1650 Navy Case No. 67336

INDEFINITE LIFE PULSE POWER SUPPLY FOR SATELLITE

Roy VonBriesen

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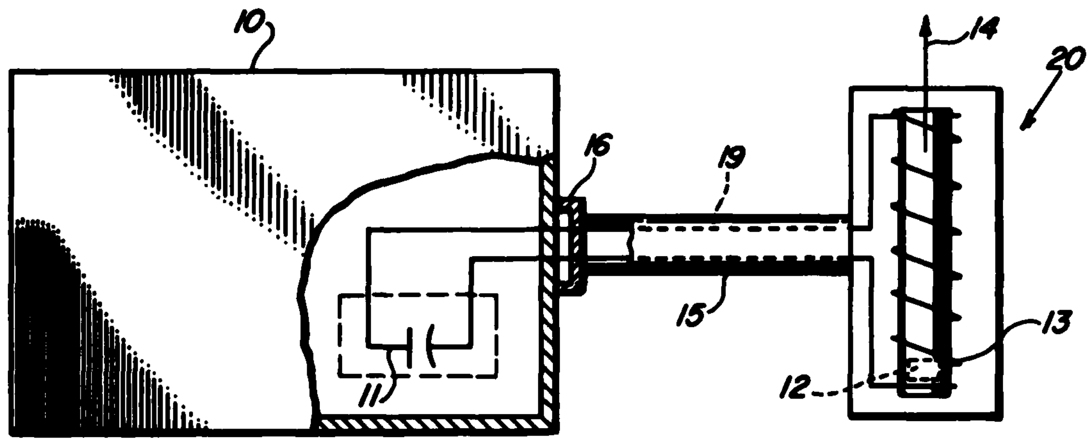

FIG. 1

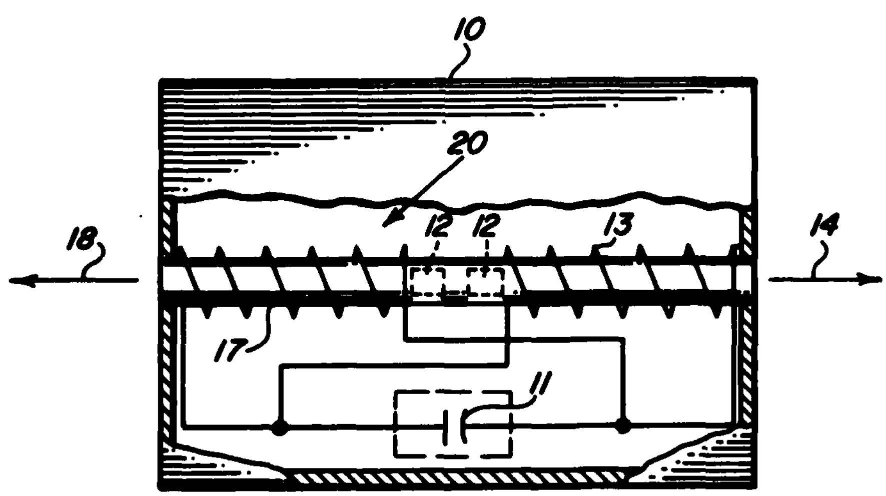

FIG. 2

Navy Tech. Cat. No. 1650 Navy Case No. 67,336

INDEFINITE LIFE PULSE POWER SUPPLY FOR SATELLITE

Roy VonBriesen

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Abstract

An indefinite life pulse power supply for a satellite is described for use in a spacecraft as may be needed to recharge onboard capacitors or to provide a voltage/current surge to any other onboard device. The device utilizes a permanent magnet driven through a solenoid.

Description

The power supply, as illustrated in Fig. 1, utilizes a magnet/coil assembly 20 in which a permanent magnet 12 is driven coaxially through a coil of wire 13 wrapped as a solenoid. Motive force for the magnet 12 can be provided by explosives or by rocket propulsion. The moving magnetic field from the driven magnet will provide a large voltage/current surge as the field moves across the coil 13 of the solenoid. This generated current can be used to charge capacitors 11 in a satellite 10 or spacecraft, or can be used for any other purpose needed in the satellite 10; for example, to drive a high power laser or particle accelerator.

The magnet/coil assembly 20 can be mounted on the satellite 10 such that, before firing, the assembly 20 is released by means of a squib 16 to a tethered position to insure that the driven magnet 12 and any forces produced by

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the firing do not affect the satellite 10. The tether 15 includes the electrical leads 19 from the coil 13 and is detached from the satellite 10 after firing, but before any reactive forces reach the satellite 10.

The magnet/coil assembly 20 could also be mounted in the satellite 10 such that the coil/solenoid 13 is housed in a tube 17 extending through the satellite 10 as shown in Fig. 2. The magnet 12 would then be driven by a rocket device from the tube 17 out of the satellite 10. By firing two magnets 12 simultaneously from the tube 17 in different directions (represented by arrows 14 and 18), the satellite will not be subjected to reactive forces.

The following table shows typical calculated cases of voltage generation using a magnet driven through a coil.

Case No.	Velocity of Magnet (m/s)	Magnet Distance (m)	Voltage per coil turn (v)
1	304.8	1×10^{-2}	0.72
2	304.8	1×10^{-3}	7.18
3	609.6	1×10^{-2}	1.44
4	609.6	1×10^{-3}	14.36
5	914.4	1×10^{-2}	2.15
6	914.4	1×10^{-3}	21.55
7	1219.2	1×10^{-2}	2.87
8	1219.2	1×10^{-3}	28.73

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In each case, the maximum magnetic field the coil sees as the magnet passes is 300 Gauss (dB/dt). The area enclosed by the coil was 7.85×10^{-5} m^2 in each sample. The distance travelled by the magnet is that necessary for the coil to be exposed to a maximum field.

As can be seen from the examples, a 100 turn coil should produce from 72 volts to 2873 volts in a single pulse, depending on magnet velocity and distance. Any current generated would depend upon the resistance of the entire circuit. The magnet/coil assembly and the charging circuit may, of course, be tailored to make the output pulse conform to the requirements of the spacecraft as to shape and generated current.

Advantages and Features

The advantage of this type of power supply is that it has an indefinite storage lifetime on the spacecraft and can be tapped when needed.

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Navy Tech. Cat. No. 6530 Navy Case No. 67693

OXYGEN BREATHING APPARATUS BREATHING BAG SIMULATOR/TRAINER

Edmund Swiatosz
Paul D. Grimmer

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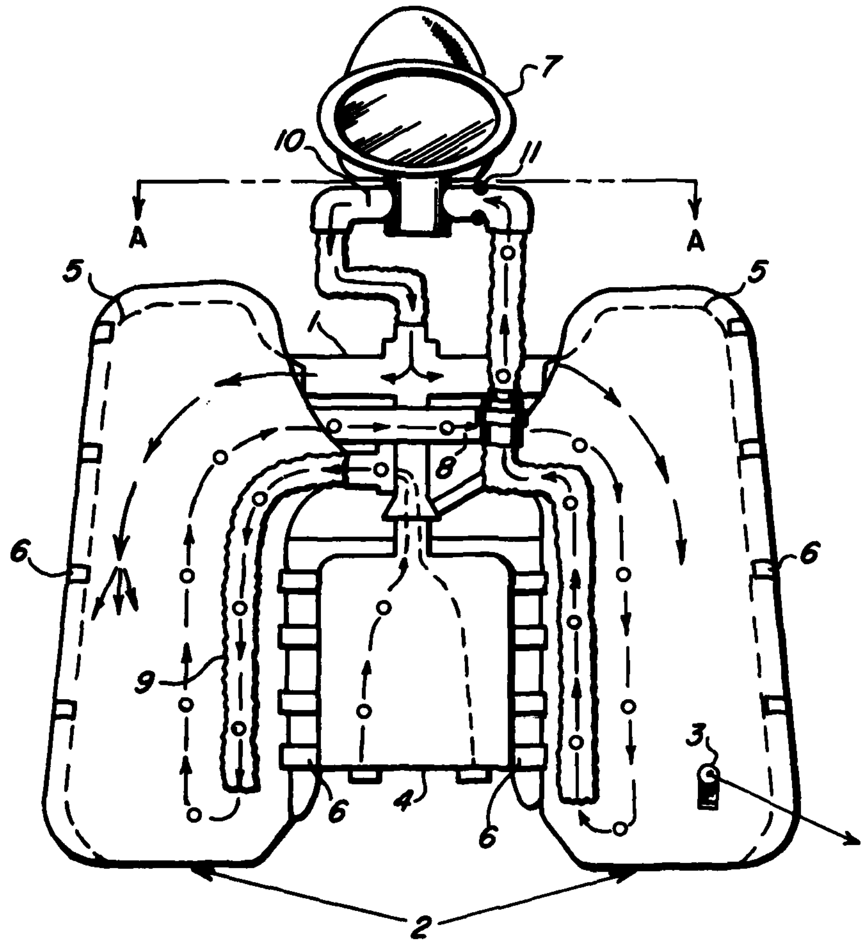

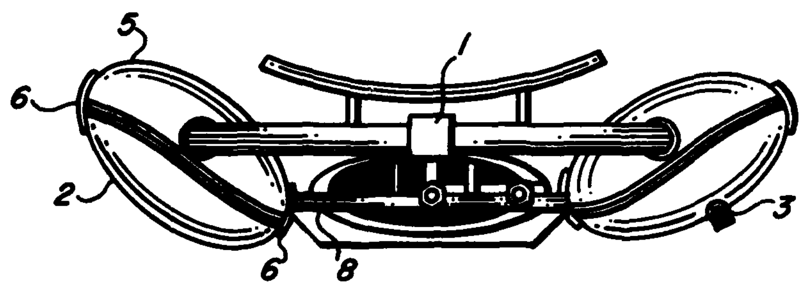

VIEW A-A (Mask Removed)

Navy Tech. Cat. No. 6530 Navy Case No. 67,693

OXYGEN BREATHING APPARATUS BREATHING BAG SIMULATOR/TRAINER

Edmund Swiatosz
Paul D. Grimmer

Naval Training Equipment Center, Orlando, Florida

Abstract

In firefighting training on devices such as the 19F1 trainer, trainees can use simulated operational breathing apparatus (OBA) canisters in operational OBA's to modify the OBA from a closed system to an open or filtered system. The instant device is a kit approach to emulating the OBA inflation which is lost when the OBA is modified to the open or filtered configuration.

Description

The device illustrated in the Figure is designed to simulate the inflated air bag of an operational OBA. An OBA exhalation bag adapter (EBA) 1 is used to connect the exhalation side of mask 7 of the OBA to an auxiliary exhalation bag (AEB) 2. AEB 2 is lightweight and similar to the operational breathing bag 5 in appearance. AEB 2 is attached to breathing bag 5 by fastener 6 to simulate the appearance of a single bag. Fastener 6 may be tape, velcro, or permanent cement.

EBA 1 provides connection via a tee bushing and connectors between the exhalation tubing of mask 7 and AEB 2, thus diverting the exhaled air from the operational breathing bag 5. Air is drawn through the simulated canister into the original OBA breathing bag 5, thence into mask 7;

thus bag 5 will be at negative pressure and will not inflate. Bag 5 will not collapse however, because of its internal tubing 9.

AEB 2 will be inflated by the exhaled air, thereby giving the OBA the same shape and appearance as if an operational canister were inserted and breathing bag 5 were inflated. When AEB 2 is filled to the desired level, relief valve 3 opens to prevent over pressurization of AEB 2.

Advantages and Features

The simulated breathing bag herein described permits the trainee to receive positive and realistic training cues for proper utilization of the OBA. Thus it enhances the cost effective approach to OBA training wherein an economical filter canister replaces the expensive closed system operational canister. It also allows the use of existing OBA's for training without major modification to the OBA and without the use of costly operational canisters.

GPO 878 423

Navy Tech. Cat. No. 6530 Navy Case No. 68004

LCD GLASSES FOR 3-D TELEVISION DISPLAY

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Bon F. Shaw
Gary M. Bond
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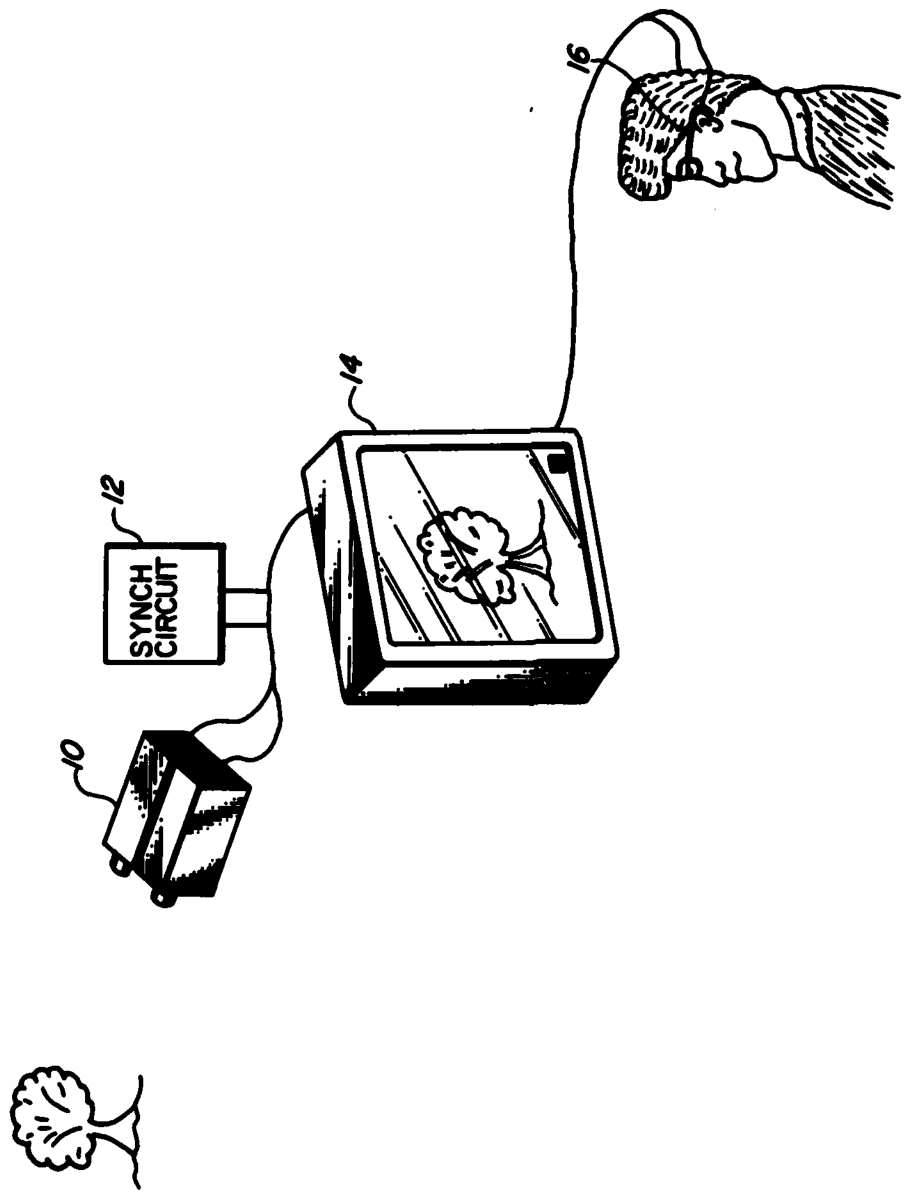

Navy Tech. Cat. No. 6530 ____ Navy Case No. 68,004

LCD GLASSES FOR 3-D TELEVISION DISPLAY

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Abstract

Enhanced training effectiveness for visual simulation may be accomplished through the utilization of conventional type television monitors to present a three-dimensional image as might be seen through a window or portal. The video display would be a synchronized combination of video derived from two video cameras. The combined video is separated based on its camera of origin by viewing glasses utilizing LCD lenses which are synchronously rendered opaque.

Description

The technology required for this advancement in video displays is in part already in use. Three-dimensional television viewing is currently accomplished by obtaining simultaneous views of a subject with video cameras which have their lenses spaced apart at a distance near the average separation of the human eyes, or slightly greater, as shown at 10 in the accompanying Figure. The operation of the cameras 10 is synchronized such that both cameras output a new field at the same instant in time. This may be accomplished by driving both cameras from the timing circuitry of one camera or by the use of an external synch circuit 12.

Such synchronous operation is commonly practiced and may have a number of alternative embodiments. Sync circuit 12 is also responsible for alternately blocking the field output by one of the cameras at 10 while transmitting the field of the other camera to monitor 14 or a recording device, not shown, such that the video displayed on monitor 14 is a combination video with its fields alternately derived from the view at the two camera locations. The appearance to the unaided eye therefore will be of a slightly defocused scene.

The three-dimensional effect is achieved by utilizing the field timing pulses of the monitor to alternately drive switched LCD material which makes up the lenses of viewing glasses 16 to be worn by an observer. This, of course, requires electrical connection to the television circuitry; however, as an alternative, a dedicated area of the display, such as a lower corner area of about a 4x4 pixel size, may be encoded such that a black or white signal is transmitted in accordance with the originating camera. Thus, at the end of each field the lenses would alternate in opacity in preparation for the next field. A suction cup mounted detector may be unobtrusively mounted to the television screen at said dedicated area, with the alternating color used to generate switching signals for the LCD glasses.

Advantages and Features

A similar system is known to exist which couples the monitor timing circuitry to electro-optic switches in the

lens area. The electro-optic switches are commonly PZLT switches which are expensive and require high voltage, i.e., 400 volts, on the switching glasses. Also the PZLT type glasses are bulky and thus somewhat uncomfortable. The LCD material used for the lenses offer the advantages of lower cost; far less shock hazard, i.e., 9 volts versus 400 volts; and they are less bulky. Also, if the suction cup mounted detector is used, any TV monitor can be used to switch the lenses at the field rate thereof.

GPO 878 423

Navy Tech. Cat. No. 6840 Navy Case No. 68142

SYNCHRONIZED DISTRIBUTED ANALOG MULTIPLEXING SYSTEM

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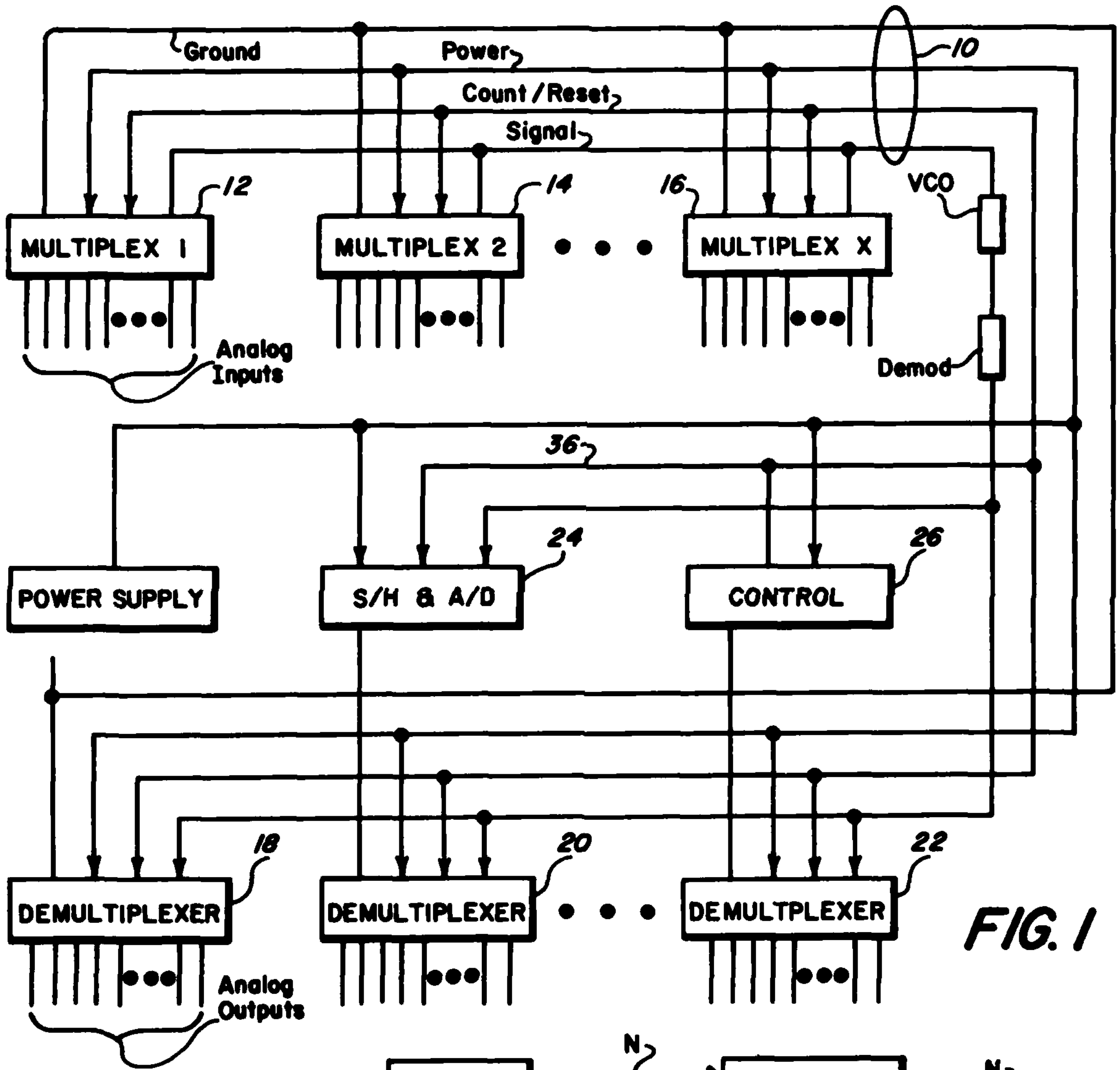

FIG. 1

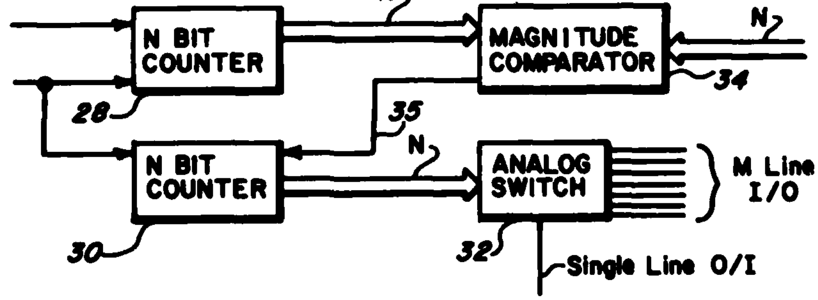

FIG. 2

Navy Tech. Cat. No. 6840 ____ Navy Case No. 68,142

SYNCHRONIZED DISTRIBUTED ANALOG MULTIPLEXING SYSTEM

Wayne I. Sternberger

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Abstract

The present system is a distributive analog multiplexing network, which has specific application in environments where there is a large separation between sensors. The system is composed of identical building block type modules that are linked together via four functional lines: ground, power, count/reset, and signal. The four functional lines may be included in a cable 10.

Description

As shown in Fig. 1, the apparatus generally comprises a series of multiplex stations 12, 14 and 16; a series of demux blocks 18, 20 and 22; a sample/hold and analog/digital block 24; and a control block 26. While the transmit (multiplex) side is well defined, the receive (demultiplex) side is adaptable to the user's requirements. If, for instance, the user wishes to recreate the analog signals in a psuedo-raw form, the demux blocks 18, 20 and 22 would be used to demultiplex the data and direct it to low pass filters (LPF's). In another instance, the time multiplexed data stream can be directly digitized by using one or more sample/hold and analog/digital (S/H and A/D) blocks. Any hybrid combination of the above can be implemented.

Control is provided by a single module 26, whose

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sole function is to sequence the data. In fact, the data sequence is controlled by the selection of data inputs at the remote sites, so the controller is essentially a pulse generator.

The multiplexer is composed of two counters 28, 30 and an analog switch unit 32, best shown in Fig. 2. The first counter 28 accepts the "COUNT" control input, and interfaces with an N bit magnitude comparator 34. The component combination forms a station identification network. The counter continuously increments, with its N output bits cyclically progressing through the 2^N combinatorial magnitudes. Unique programming of the comparison inputs to the comparator defines one of the 2^N output states of the counter. When the counter is identical to the comparison code, a logic pulse is generated on line 35. The logic pulse in turn increments the second counter 30, whose outputs select one of M analog inputs from the analog switch 32.

All remote multiplex stations are synchronized by means of the reset control line 36. Therefore, all of the station identification counters will be at the same count at any given time. Phasing of the counter signals causes the analog switches to increment to the next input immediately after the previous signal is multiplexed onto the signal bus. This affords the maximum settling time prior to sampling.

The stations can be reconfigured such that all

inputs are sampled at the same instant in time. The signals would then be held in sample/hold devices, and time multiplexed in a manner similar to the above.

In the case that analog outputs are required, one would use the same functional arrangement as in the multiplexer for the demultiplexers (see Fig. 2). Analog input/outputs would be reversed such that one bus would feed all of the analog switches and M outputs would handle the individual decoded signals. Suitable low pass filtering would be necessary in order to smooth the output.

The controller 26 (see Fig. 1) is a simple time base oscillator and a power-up reset circuit. Upon power-up, the controller would issue a RESET command along line 36 in order to synchronize all stations. Subsequent to that, the oscillator would run ad nauseam, causing continuous cycling of the remote stations. For more complex installations, one might inject a sync level into the analog signal stream in order to detect loss of synchronization.

Straight A/D conversion of the time multiplexed signal can be accomplished by means of one or more A/D's and S/H's 24 hooked to the analog bus and the control bus. Control functions and signal identification would be accomplished by a circuit similar to the multiplexer module. All bits of the two counters would be provided as a parallel word in order to define station and signal source. In the event of high sampling rates, more than one A/D may be required.

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Bus drivers and/or encoders and decoders may be required for long signal paths and/or noise immunity. These may be one of a number of types, such as voltage-to-frequency converter or current loop.

Advantages and Features

The system represents an improvement over prior art devices which rely on centralized analog multiplexing. The system is extremely versatile and allows a multiplexing station to be added to or removed from the cable without disturbing other multiplex stations on the cable.

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DIGITAL MODEM FOR METEOR SCATTER CHANNEL

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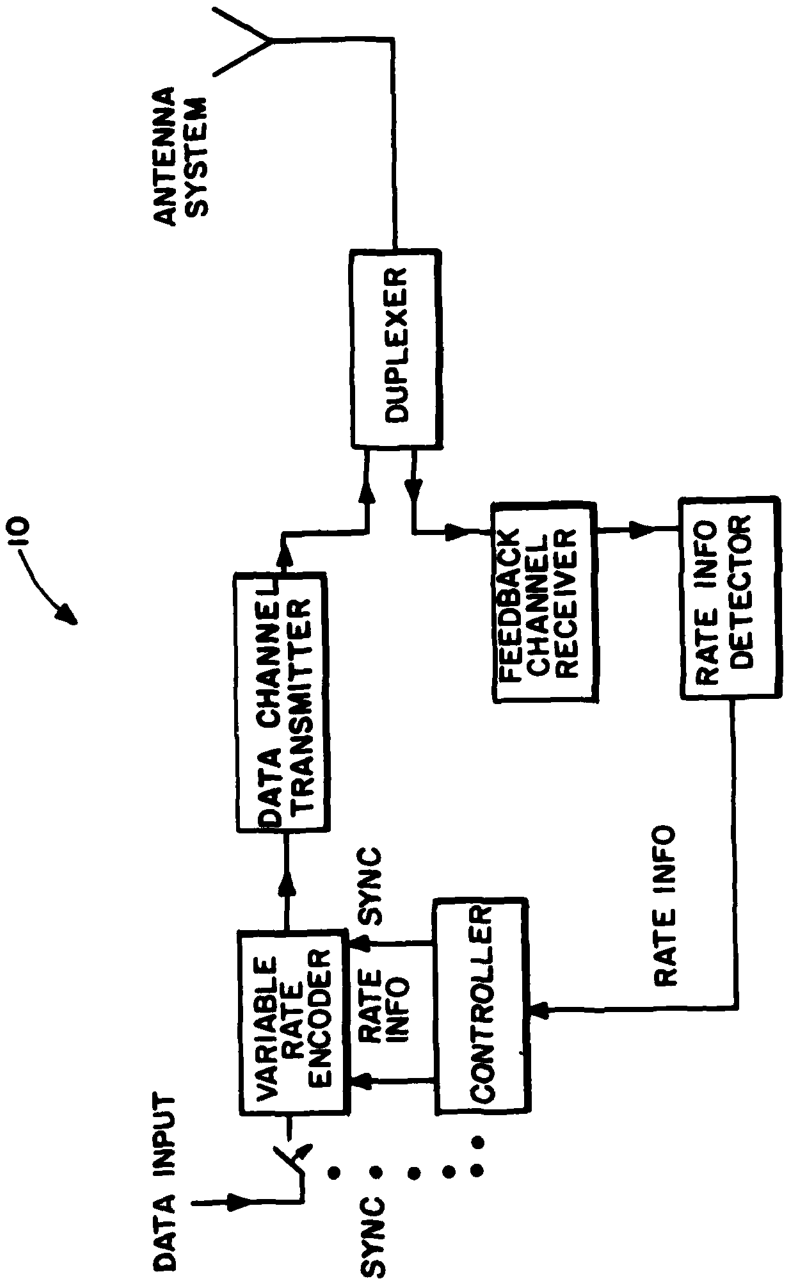

FIG. 1

Navy Tech. Cat. No. 6440

Navy Case No. 67377

DIGITAL MODEM FOR METEOR SCATTER CHANNEL

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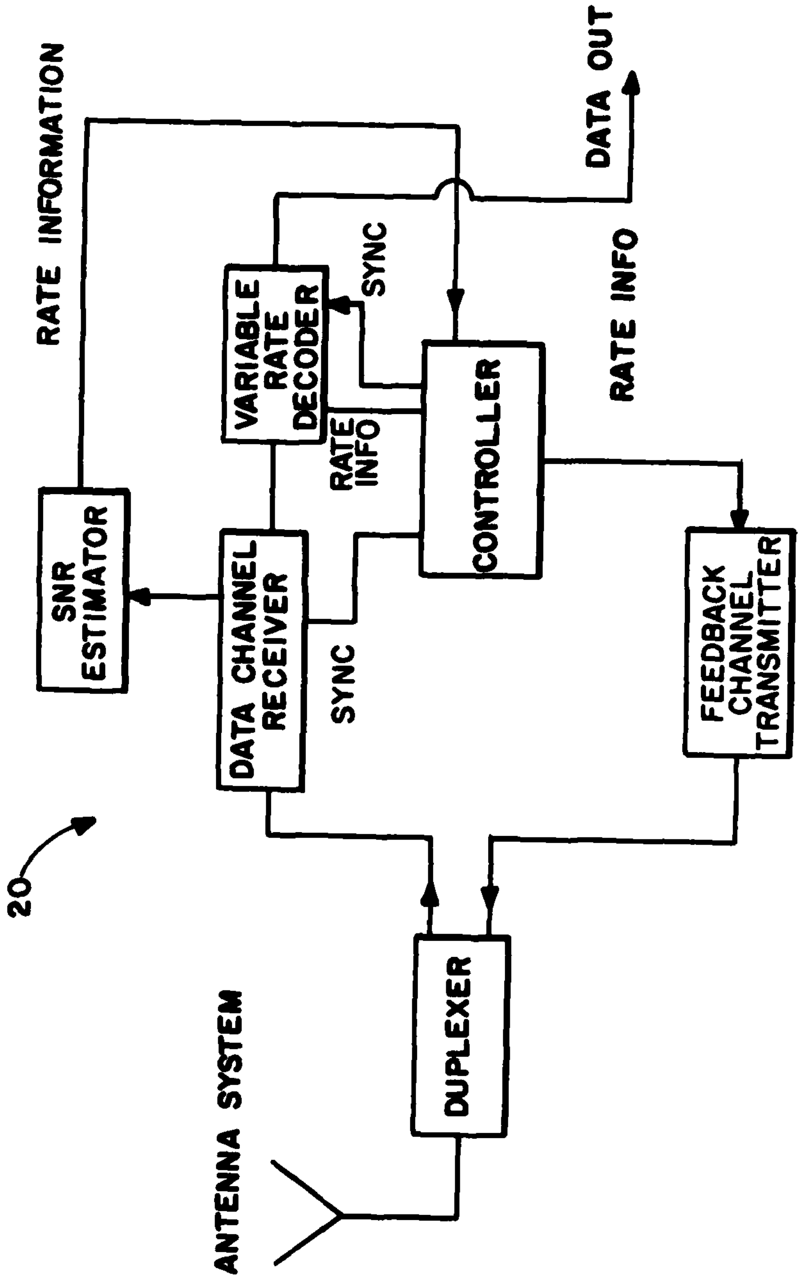

FIG. 2

Navy Tech. Cat. No. 6440 Navy Case No. 67,377

DIGITAL MODEM FOR METEOR SCATTER CHANNEL

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Abstract

The digital data rate is varied for a high speed digital data transmission on meteor scatter channels to allow the matching of the digital data rate to changing channel conditions and thereby combat multipath fading and intersymbol interference. Carrier and data synchronization is acquired by transmitter and receiver stations so that a probing signal from the transmitter station allows measurement of the channel conditions at the receiver station. This determines the data rate which will give a desired error free performance by transmitting channel condition information via a feedback sub-channel to the transmitting station.

Description

The variable information rate transmission capability makes use of the data rate adaptivity to match the information rate of the system to the changing channel conditions and therefore makes efficient use of the channel, note FIGS. 1 and 2.

The meteor scatter channel is characterized as being intermittent with a time decaying gain function and a time increasing multipath profile. Heretofore, these factors have greatly limited the utility of meteor scatter for

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communication purposes. Current ~~meteor~~ modem technology is more thoroughly set forth in three publications; the first, by Bartholome, Pierre and Irmfried Vogt in their article titled "Comet, A New Meteor Burst System Incorporating ARQ and Diversity Reception," IEEE Transactions on Communication, Vol. Com 16, No. 2, April 1968; and next, Crysdale, J. H. "Analysis of the Performance of the Edmonton-Yellowknife JANET Circuit," IRE Transactions on Communications March 1960 and, lastly, Carpenter, R. J. and Ochs, G. R. "The NBS Meteor Burst Communications System," IRE Transactions on Communications Systems, December 1959. Briefly these technologies consist of modified HF teletype modems that operate at a fixed data rate regardless of channel conditions and, as such, do not make efficient use of the channel. The average data rates of these modems averaged over a 24 hour period for one year are in the range of 50 to 150 bits per second with the transmit power of 2,000 watts and probability error of 0.001. In contrast, it can be shown that for an idealized system with comparable transmitter power an average data rate of about 7,500 bits per second is possible.

The description of operation of the modem is simplified when one way data transmission is considered and a transmitting station 10 is designated as the sender and a receiving station 20 is designated as the receiver station. As the transmitter station emits a constant, repetitive, coded probing signal and the receiving station receives the signal indicating the

establishment of a meteor channel, an answering signal in response to the probing signal is transmitted with a signal on a feedback subchannel. Both stations proceed to acquire carrier and data synchronization and the receiving station measures the channel conditions such as signal to noise ratio, multipath and doppler effects and determines the data rate which will give the desired error performance. Data rates are varied by lengthening the information signals forming rate of $\frac{1}{N}$ repetitive codes where N is an integral divisor of some fundamental data rate; for the modem design this fundamental rate was about 500 E three bits per second.

Data rates chosen by the receiving station next is sent via the feedback subchannel to the sending station. After reception and verification of the data rate information, the sending station sends 100 megaseconds of data via a data subchannel. The 100 megasecond signaling interval has been determined as a result of studies of the average fading bandwidth.

After reception of the 100 megaseconds of data, the receiving station once again measures the channel conditions, computes a new rate to match the new channel conditions and then sends this information to the transmitting station which after verification, once again sends 100 megaseconds of data to the receiver. The entire procedure is repeated until the channel conditions deteriorate below a prescribed set of conditions at which time the receiving station requests that

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the transmission be terminated.

Proper functioning of the transmitter and receiving stations requires the partioning of the available bandwidth into four subchannels. Two wideband subchannels are required for the two way transmission of data between stations and two narrow band subchannels are acquired for the transmission of channel information.

Advantages and Features

Intersymbol interference is combatted by probing the channel to determine the multipath spread and lengthening the information symbol so that bit rate is greater than the multipath spread. The information used by the modem is the highest rate which satisfies both the multipath and signal to noise ratio requirements. A capability for operation at computer simulation speeds is provided for in that average data rates in excess of 4,200 bits per second are possible which are 50 times better than present modems described in the literature operating under comparable conditions. The techniques described are applicable to any wideband channel which is characterized by rapid fluctuations of gain and multipath parameters.

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Navy Tech. Cat. No. 3800 Navy Case No. 67921

LIQUID CRYSTAL TEMPERATURE MEASUREMENT DEVICE

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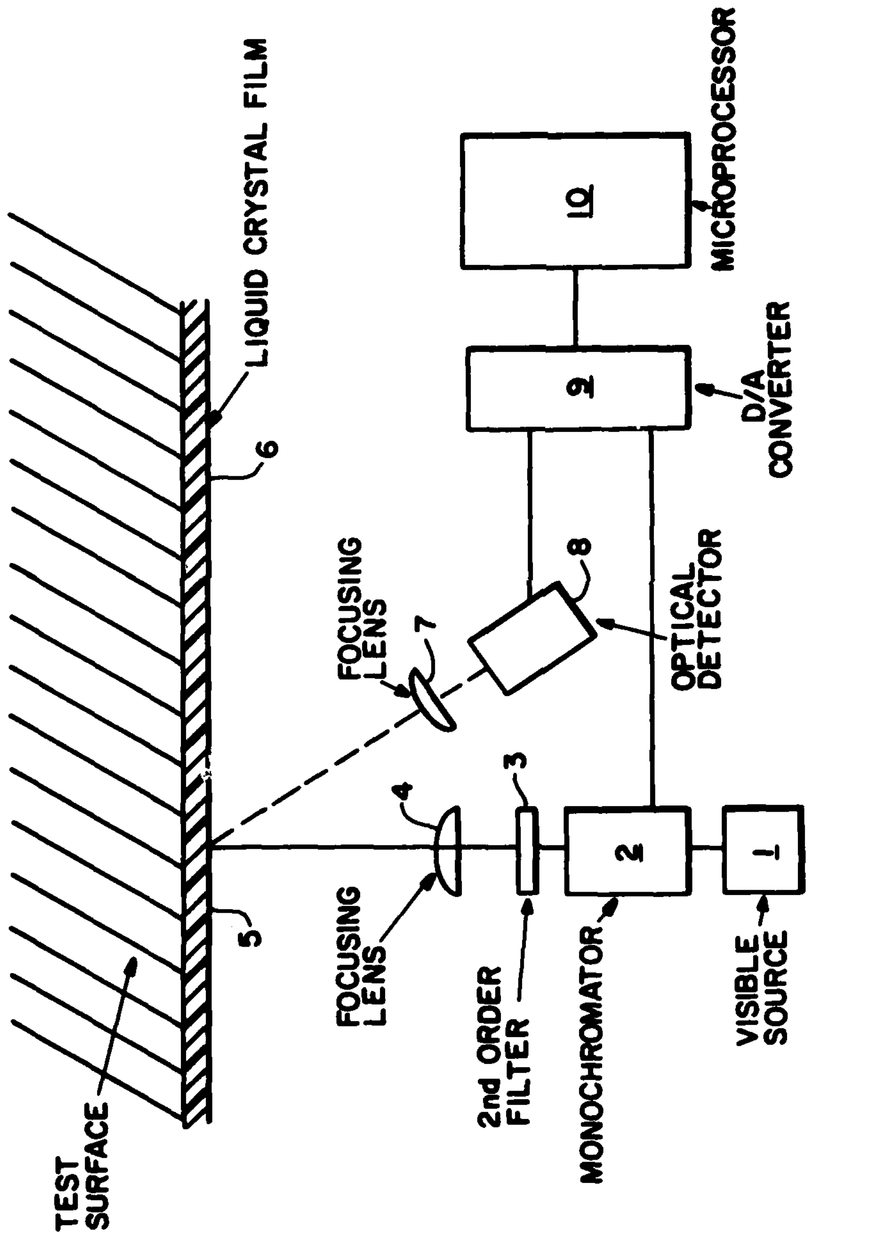

FIG. 1

LIQUID CRYSTAL TEMPERATURE MEASUREMENT DEVICE

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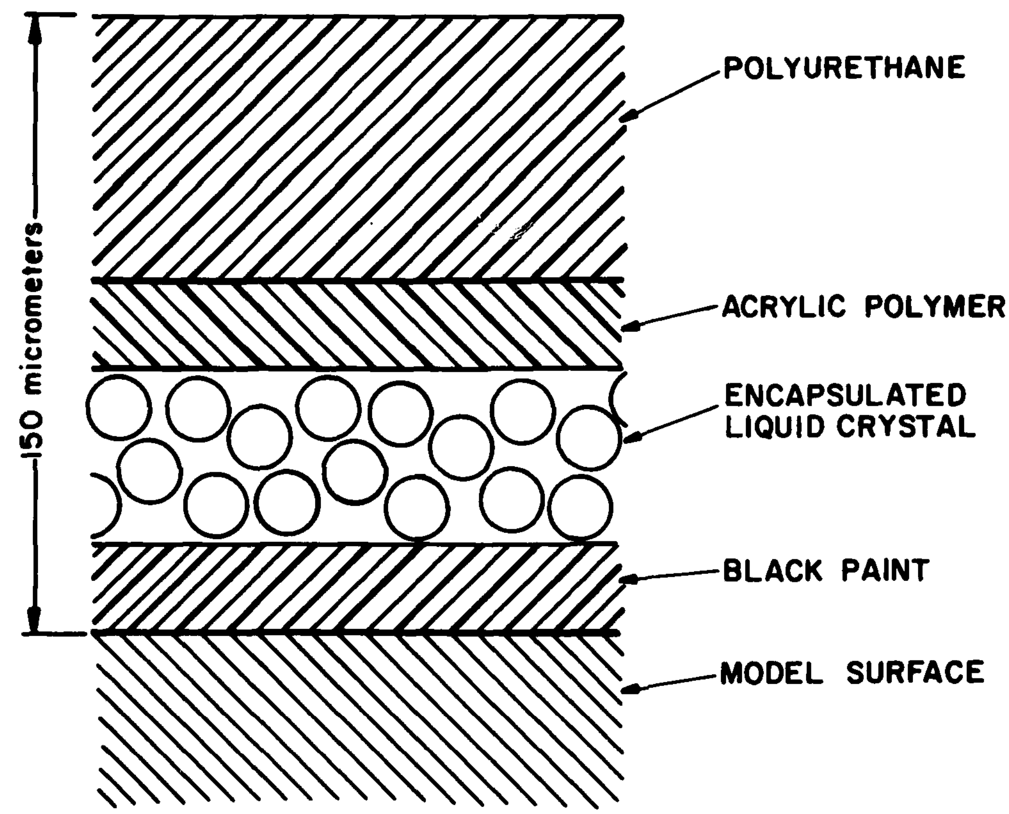

FIG. 2

Navy Tech. Cat. No. 3800 ____ Navy Case No. 67921

LIQUID CRYSTAL TEMPERATURE MEASUREMENT DEVICE

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Abstract

Cholesteric liquid crystals are applied in a thin film on a remotely located surface for measuring its temperature. The film is illuminated and light of a particular wavelength is reflected depending on the temperature of the film.

Description

Thermographic liquid crystals are materials which, within their operating temperature range, reflect a narrow wavelength band of light. The wavelength of peak reflectivity is very temperature dependent. The reflected color spans the entire visible spectrum from violet to red as the temperature varies within the liquid crystal's characteristic range.

A thin film 6 containing temperature-sensitive, microencapsulated liquid crystals is applied to a test surface 5. A tunable source of light is provided by a source 1 passing its beam through a monochromator 2. The monochromator is manually or computer scanned to a wavelength of interest and fed through a filter 3 and to a lens 4 which focuses the aperture of the monochromator on a spot on the test surface. Light that is reflected from the

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test surface is focused by a lens 7 onto the active surface of an optical detector 8 which can be a photomultiplier, photoconductor or similar detector. The output from the detector is fed to a D/A converter 9.

By varying the wavelength passed by the monochromator and observing the output of the optical detector, the wavelength of maximum reflectance easily is found and is converted to a temperature by means of a prior calibration of the liquid crystal film (a calibration curve of a particular liquid crystal can be generated by taking measurements using the above procedure with a liquid crystal film which has been intimately attached to a temperature measuring device such as a thermocouple or a thermister). The procedure lends itself for control by a microprocessor 10 or microcomputer that tunes the monochromator and the output of the optical detector. The processor can correct the output of the optical detector for the variation in the output intensity of the monochromator, select the wavelength of maximum reflectivity and compute the temperature.

The liquid crystal layer shown in FIG. 2 has a better color response when it is applied on a test surface painted flat black. Microencapsulated liquid crystals contained in a water slurry are applied with an air brush and a thin layer of water thinnable acrylic polymer was applied over the liquid crystal layer to protect it from volatile chemicals that might otherwise dissolve the

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microspheres, contaminate the solution or otherwise destroy the color response of the system. A polyurethane layer provided a tough, workable finish which was water resistant and shielded the liquid crystal from shear forces which would otherwise interfere with the temperature measurements. The average thickness of the four layers was about 150 micrometers.

Advantages and Features

This device will operate in water which would not transmit infrared radiation. There is no physical link between the test surface and the measurement apparatus. The contours and heat transfer properties of the test surface are less disturbed than with conventional techniques which require implanted electrical sensors. Location of the film does not significantly alter the heat transfer properties of the surface being tested nor is the film difficult to mount on the test surface.

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Navy Tech. Cat. No. 1534 Navy Case No. 67674

A FLAT CABLE INTERCONNECTION GROUNDING SYSTEM

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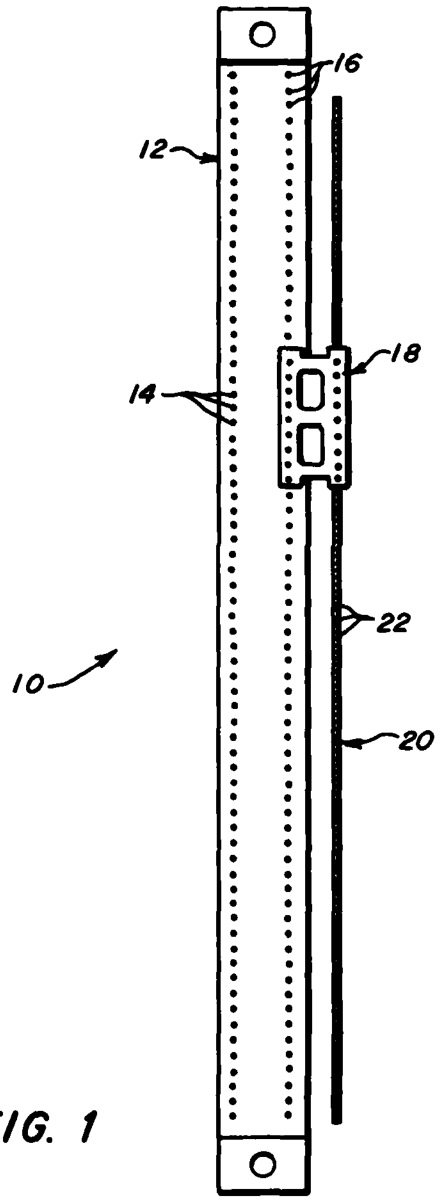

FIG. 1

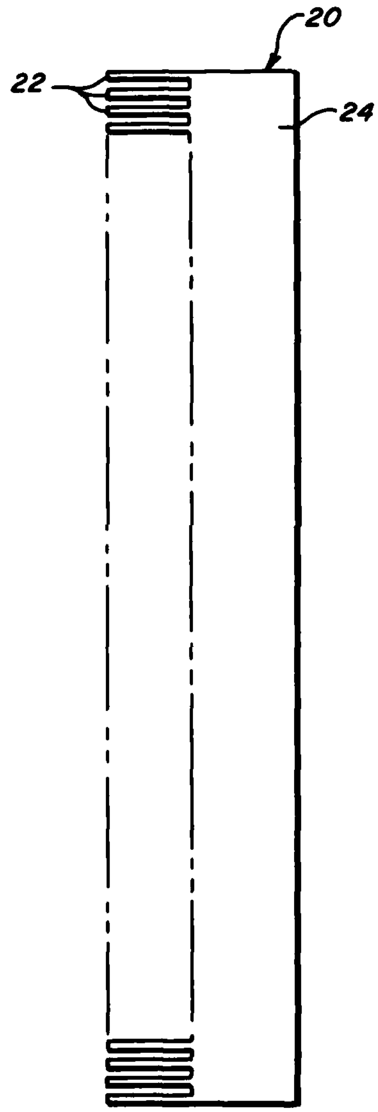

FIG. 2

Navy Tech. Cat. No. 1534 ____ Navy Case No.67,674

A FLAT CABLE INTERCONNECTION GROUNDING SYSTEM

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Abstract

A flat cable interconnection grounding system is configured for use with wire-wrap chassis connectors or the like. The grounding system comprises, inter alia, a unique comb conductor, which includes a plurality of wire-wrap pins affixed to a common base strap so as to form a unified electrical conductor. In practice, one row of a flat cable connector of the grounding system is mated with wire-wrap pins of a wire-wrap chassis card connector, and the other row of the flat cable connector is mated with wire-wrap pins of the aforementioned comb conductor, which can be, via its common base strap, connected to ground or any voltage. Thus, the wire-wrap pins of the wire-wrap chassis card connector that would normally be used for grounds can now be used for signals, thereby doubling the signal density and reducing costs.

Description

The primary purpose of the flat cable interconnection grounding system is to ease the construction of high speed digital electronic equipment, save space and money and maintain good quality signal transmission through cabling systems when using wire-wrap chassis connectors or their equivalents.

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As digital systems increase in complexity, the number of signals becomes burdensome and can exceed the number of connections that are available in a given configuration. Further, when using flat cable for transmitting the digital signals, it is customary to use a ground conductor between signal lines to minimize crosstalk between signals that would normally be adjacent to each other. When the flat cable is brought to, for example, a wire-wrap chassis connector, the grounds must be connected along with the digital signals. This usually means there must be connector pins available for the number of digital signals times two, i.e., one pin for each digital signal and one pin for each ground corresponding thereto.

The problems outlined in the foregoing discussion, are solved by employing a grounding system like the flat cable interconnection ground system 10 shown in FIG. 1. The grounding system 10 comprises a wire-wrap chassis card connector 12 having adjacent rows of wire-wrap pins 14 and 16, a flat cable connector 18 having connector rows, as shown, and a comb conductor 20 having a row of corresponding wire-wrap pins 22 (i.e., corresponding to either wire-wrap pins 14 or 16) and as better shown in FIG. 2, a base strap 24. Thus, the comb conductor 20 introduces one or two extra rows (if two comb conductors 20 are used, one adjacent each of the wire-wrap pins 14 and 16) of wire-

wrap pins 22 adjacent and parallel to the wire-wrap chassis card connector 12.

In practice, one connector row of the flat cable connector 18 is mated with, for example, the wire -wrap pins 16 of the wire-wrap chassis card connector 12, and the other connector row thereof is mated with the wire-wrap pins 22 of the comb conductor 20. The base strap 24 of the comb conductor 20 can be connected to ground or any voltage. Normally, a flat cable (not shown) is connected to the flat cable connector 18. Consequently, the flat cable connector 18 will very neatly tie the signals on the flat cable to the wire-wrap pins 16 of the wire-wrap chassis card connector 12 and the grounds to the comb connector 20 due to the staggered translation of flat cable conductors to alternate connector rows of the flat cable connector 18.

Advantages and Features

One advantage of the grounding system discussed is that the pins normally used for grounds on the wire-wrap chassis connector can be freed-up and used for signals thereby doubling the signal density, and, accordingly, reducing costs. This is made possible because the grounding function is effectively performed by the comb conductor. The comb connector can be configured to have very low impedance to ground. This feature will contribute to signal fidelity and overall system reliability.

Navy Tech. Cat. No. 0265 Navy Case No. 67758

ANTENNA MOUNT SUBASSEMBLY

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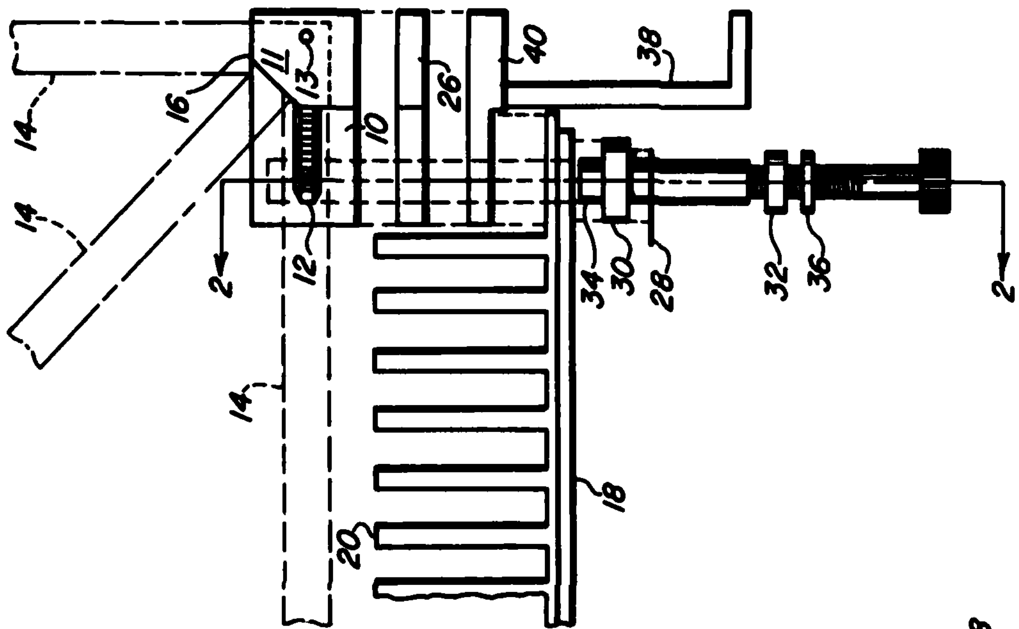

FIG. 1

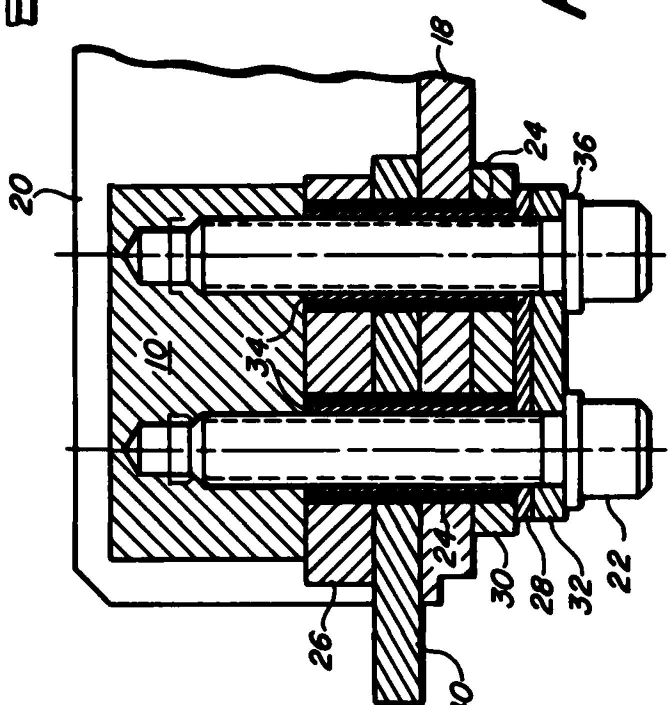

FIG. 2

Navy Tech. Cat. No. 0265 ____ Navy Case No. 67758

ANTENNA MOUNT SUBASSEMBLY

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Abstract

Antenna mount subassembly for communication equipment that is generally comprised of a mounting block for pivotally and adjustably mounting an antenna on the equipment without requiring disconnection therefrom. Appropriate fasteners, such as capscrews, affix the block to the equipment chassis. A series of plate-like insulator elements together with insulator sleeves electrically separate the block from the chassis while at the same time maintaining a positive electric connection between the block and the equipment circuit. Depending on the use of the equipment, a channel shaped bracket for mounting a tripod leg support arrangement may be interposed between the chassis and the block without interfering with the electric connection. By reason of the block pivotally mounting the antenna without disconnection from the equipment, repeated use and easy handling of both the antenna and the equipment is possible.

Description

An antenna mount subassembly for communication equipment is very important for various reasons, such as enabling continued use and operation of the equipment

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despite normal wear and tear of the antenna mount itself. Regardless of the use of communication equipment, prior antenna mount subassemblies were often cumbersome or after repeated use failed in providing a positive electric connection, usually due to normal wear and tear. This failure of course results in unsatisfactory operation of the equipment until the antenna mount subassembly is replaced, if possible, or otherwise repaired. The present antenna mount, as discussed below, assures continued operation of the equipment despite repeated use of the antenna.

As illustrated in Fig. 1, an antenna mount subassembly is generally comprised of a block 10, one side of which is partially cut away to define a protrusion 11. The protrusion includes a slot for receiving a threaded stud 12. The inner end of stud 12 is pivotally connected to a shaft 13 at the bottom of the slot. An antenna 14 of suitable or telescopic design is threadably connected at its lower end to the outer end of the stud. By reason of the series of three flat faces 16 on protrusion 11, the antenna can be locked in either a horizontal stored position or a selected raised operating position when the lower threaded end of the antenna is rotated relative to stud 12 until the antenna lower end positively abuts and lockingly engages an associated face 16 in the manner shown in Fig. 1.

As best shown in Fig. 2, the subassembly is affixed to communication equipment usually at a corner thereof. The

equipment is generally made up of a chassis with a cover plate 18 and a series of parallel-spaced upstanding heat-dissipating fins 20. For the sake of brevity, neither the sidewalls nor the bottom of the chassis are shown. The bottom of block 10 is provided with a pair of openings for receiving a pair of capscrews 22. A pair of openings 24 are also provided in cover plate 18 for receiving the threaded ends of the capscrews. A plate-like insulator element 26 is interposed between block 10 and cover plate 18 so as to electrically isolate block 10 from plate 18.

To provide an electric connection between the pair of capscrews 22 and the antenna connection end of the equipment circuit (not shown), an electric sheet-metal strip 28 with a pair of spaced apertures for receiving the threaded ends of the pair of capscrews 22 is disposed beneath chassis plate 18. Strip 28 includes suitable means for effecting a soldered electric connection to the equipment circuit (not shown). A plate-like insulator element 30 with spaced apertures is disposed beneath plate 18 so as to cover the top major surface of strip 28 while at the same time isolate it electrically from plate 18. A double-apertured bearing plate 32 contacts the bottom surface of strip 28. To further insulate each capscrew 22 from plate 18, an insulating sleeve 34 surrounds an intermediate portion of the capscrew threaded end. Each sleeve 34 extends between strip 28 and the bottom of block 10 when block 10

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is affixed to plate 18 by the pair of capscrews 22. To assure that capscrews 22 remain securely fastened to block 10 after it is affixed to plate 18, each capscrew is provided with a lockwasher 36. By reason of the pair of capscrews, block 11 is positively held in its attached position to plate 18 during normal use of the equipment without the danger of the block becoming loose and thus shorting-out, e.g., against adjacent heat fin 20.

Depending on the use of the equipment, such as in the field, and the particular design of the antenna mount subassembly attached thereto, a bracket 38 of channel shape for mounting an extendable tripod leg arrangement (not shown) is illustrated in Fig. 1. The bracket includes an apertured leg portion 40 that is interposed between insulator plate 26 and chassis plate 18 when block 10 is secured to plate 18 as depicted in Fig. 2.

By reason of antenna 14 being in an out-of-the-way stored position when in a horizontal position as shown in Fig. 1, the antenna design does not significantly alter the overall shape of the communication equipment to which it is affixed. Consequently, the equipment with the antenna mount attached thereto can easily be packaged for shipment. Further, the equipment is easily handled in the field when unpacked without interference from the antenna. Because of the threaded connection between antenna 14 and stud 12, the antenna can be repeatedly loosened without the danger of

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disconnecting the antenna from stud 12. The antenna can also be repositioned and always positively abutted against a face 16 so as to positively lock it in a desired position despite any normal wear and tear while at the same time always maintaining a positive electric connection between the antenna and block 10.

Advantages and Features

The antenna mount subassembly for communication equipment positively attaches a block to the equipment not only for pivotally mounting an antenna but also for positively securing the antenna (even after repeated use and normal wear and tear) in any desired storage or operational position in relation to the equipment without the danger of the antenna being electrically or otherwise disconnected from the mounting block. By reason of appropriate insulation elements interposed between the block and the equipment, a positive electric connection is maintained between the antenna and the equipment circuit.

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Navy Tech. Cat. No. 1203 Navy Case No. 67760

A PROBABILITY ANALYZER

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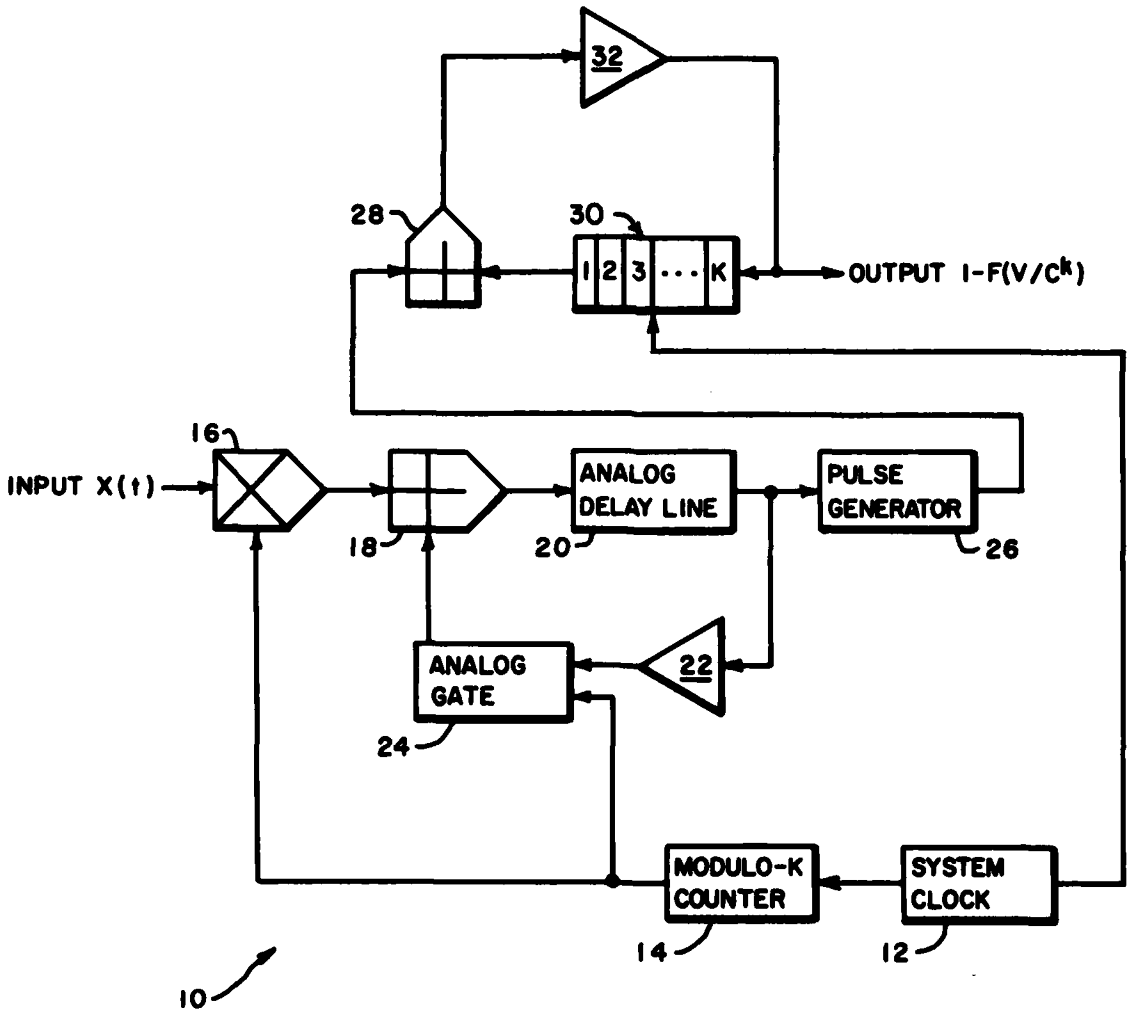

Navy Tech. Cat. No. 1203 ____ Navy Case No. 67,760

A PROBABILITY ANALYZER

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Abstract

An apparatus, termed a probability analyzer, is configured to automatically compute the amplitude probability distribution of a signal at its input which is the analog of a predetermined physical influence. The apparatus comprises a plurality of elements including, inter alia, a system clock, a modulo-K counter, an analog multiplier, a first adder, an analog delay line, an analog gate, a first refresher amplifier, a pulse generator, a second adder, a propagatory analog delay line and a second refresher amplifier. The elements of the apparatus are operatively connected and arranged in such a fashion as to produce the probability distribution of the signal at its input using less energy than previously known devices.

Description

Referring to the FIGURE, a probability analyzer 10 suitable for computing the amplitude probability distribution of a signal $X(t)$ at its input includes a system clock 12 for generating a regular sequence of timing pulses (not shown) at the rate of f_0 per second. The clock signal is applied to the input of a modulo-K counter 14 which counts the number of timing pulses. When the count reaches the value K, the modulo-K counter 14 resets to zero and emits an indicator pulse (not shown) having unit height and a duration of T_1 milliseconds.

The indicator pulse is applied to one input of an analog multiplier 16 and the signal X(t) is applied to the other input thereof. Consequently, the output of the analog multiplier 16 is zero except when there is an indicator pulse to cause the signal X(t) to be transferred to the output thereof, and, hence, to one input of a first adder 18. When the other input of the first adder 18 is at a zero level, the output of the analog multiplier 16 is transmitted by the first adder 18 to the input of an analog delay line 20.

If the probability analyzer 10 starts-up at a time, $t = 0$, then the first indicator pulse from the modulo-K counter 14 will occur at the time $t = K/f_0$, and accordingly, the analog delay line 20 will be driven by a pulse having a width of T_1 and a height of $X(K/f_0)$. The time required for this pulse to propagate through the analog delay line 20 is T_0 milliseconds, where $T_0 = 1/f_0$. For proper operation, T_1 is much less than T_0, i.e., an order of magnitude less.

When the aforementioned pulse transits the length of the analog delay line 20, a facsimile of the pulse is returned to the input thereof, a first refresh amplifier 22 (having a gain of C), an analog gate 24 and the one input of the first adder 18. The analog gate 24 operates like a normally closed switch, between its one input connected to the output of the first refresher amplifier 22 and its output connected to the one input of the first adder 18, only when the indicator pulse from the modulo-K counter 14 on its other input is at a zero level. On the other hand, when the indicator pulse is at an up level, the analog gate 24 is caused to be

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opened thereby preventing the passage of a signal therethrough. Thus in coaction, inter alia, with the analog gate 24, the output of the analog delay line 20 is fed back to its input exactly K times until the signal is blocked by the presence of the indicator pulse on the other input of the analog gate 24. The foregoing is predicated on the analog delay line 20 being lossless, and the gain C for the first refresher amplifier 23 being equal to unity. However, in actual practice, to achieve appropriate operation of the probability analyzer 10, the gain of the first refresher amplifier 22 is set to a value less than unity. Then the pulse in the analog delay line 20 will have an initial height of $X(K/f_0)$ and be reduced to a height of $C^N X(K/f_0)$ after looping through the analog delay line 20 N times.

To continue, a pulse generator (or monostable multivibrator) 26 generates a pulse of T_1 seconds width each time it is driven by a voltage that exceeds a predetermined threshold level, V. The pulse from the pulse generator 26 is added via a second adder 28 to the contents of a stage 1 of a propagatory analog delay line 30. In practice, the propagatory analog delay line 30 comprises K stages of analog shift registers fashioned of charge-coupled-devices in which each stage acts as a storage reservoir of electronic charge. Each timing pulse from the system clock 12, aforementioned, causes the propagatory analog delay line 30 to undergo a cyclic permutation in which the contents of the k-th stage are transferred or propagated to stage k-1. The contents of stage 1 are transferred to stage K via a second refresher amplifier 32 thereby

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completing the cycle. The second adder 28 takes the voltage of stage 1 and adds it to the voltage, if any, at the output of the pulse generator 26 at intervals of T_0 milliseconds. This sum voltage is fed to the second refresher amplifier 32 which presents a proportionate amount of electronic charge to stage K of the propagatory analog delay line 30.

At the time of start-up, the K stages of the propagatory analog delay line 30 are empty, i.e., zero voltage and zero charge. After 2K pulses of the system clock 12, the propagatory analog delay line 30 will have undergone two cyclic permutations of its stages. The first N stages will have "unit" voltage or charge, where N is the first number such that

$$C^{N+1}X(K/f_0)<V.$$

After (M+1) clock pulses from the system clock 12, the propagatory analog delay line 30 will have permuted M+1 times and the input thereof will have been sampled M times. Let the number of voltage (charge) units in stage k of the propagatory analog delay line 30 be denoted as A(k), k=1, 2, ... , K. Then obviously, A(1) is greater or equal to A(2), which is greater or equal to A(3) and so on. The greatest value that A(1) can have is M, which corresponds to every one of the samples, $N(KT_0)$ through $X[(M+1)KT_0]$ being larger than V.

To prevent the overflow of voltage (charge) in the stages of the propagatory analog delay line 30 (without stopping the sampling process), the gain of the second refresher amplifier 32 is set at a value B, which is

$$B = 1-u/V',$$

where u is the "unit" voltage and V' is the maximum voltage that a stage

of the propagatory analog delay line 30 can hold.

Thus, the overflow of the stages of the propagatory analog delay line 30 is prevented by allowing for the controlled loss of charge as each stage is cycled from the first to the K-th position. This controlled loss has the additional effect of causing the probability analyzer 10 to "forget" old data. In fact, the contents of the stages of the propagatory analog delay line 30, after a long period of time, represent the complement of the amplitude probability distribution of an input signal based on observations weighted less according to their age. After many times K pulses of the system clock 12, A(1) represents the number of times the input was sampled at a level greater than V, A(2) represents the number of times the input exceeded V/C, and A(k) represents the number of times the input exceeded V/C^k. Hence, the other output of the second adder 28 presents a sequence A(1) through A(K) of values which represent the numbers 1-F(V) through $1-F(V/C^K)$, respectively, where F is the amplitude probability distribution of the input signal, X(t).

Advantages and Features

The probability analyzer 10 described herein has the advantage of being producible in the form of a compact, efficient, modular package that can be readily interfaced with a variety of data acquisition systems. The main feature is the use of charge-coupled-devices to fabricate the propagatory analog delay line 30 which results in an ultra-low-power expenditure. Accordingly, dramatic savings in energy, which are significant when battery-powered and isolated data acquisition systems are put into service, can be realized.

Navy Tech. Cat. No. 3806 Navy Case No. 67829

A METHOD OF REMOTE OPTICAL SPECTROGRAPHIC ANALYSIS OF TEST MATERIALS

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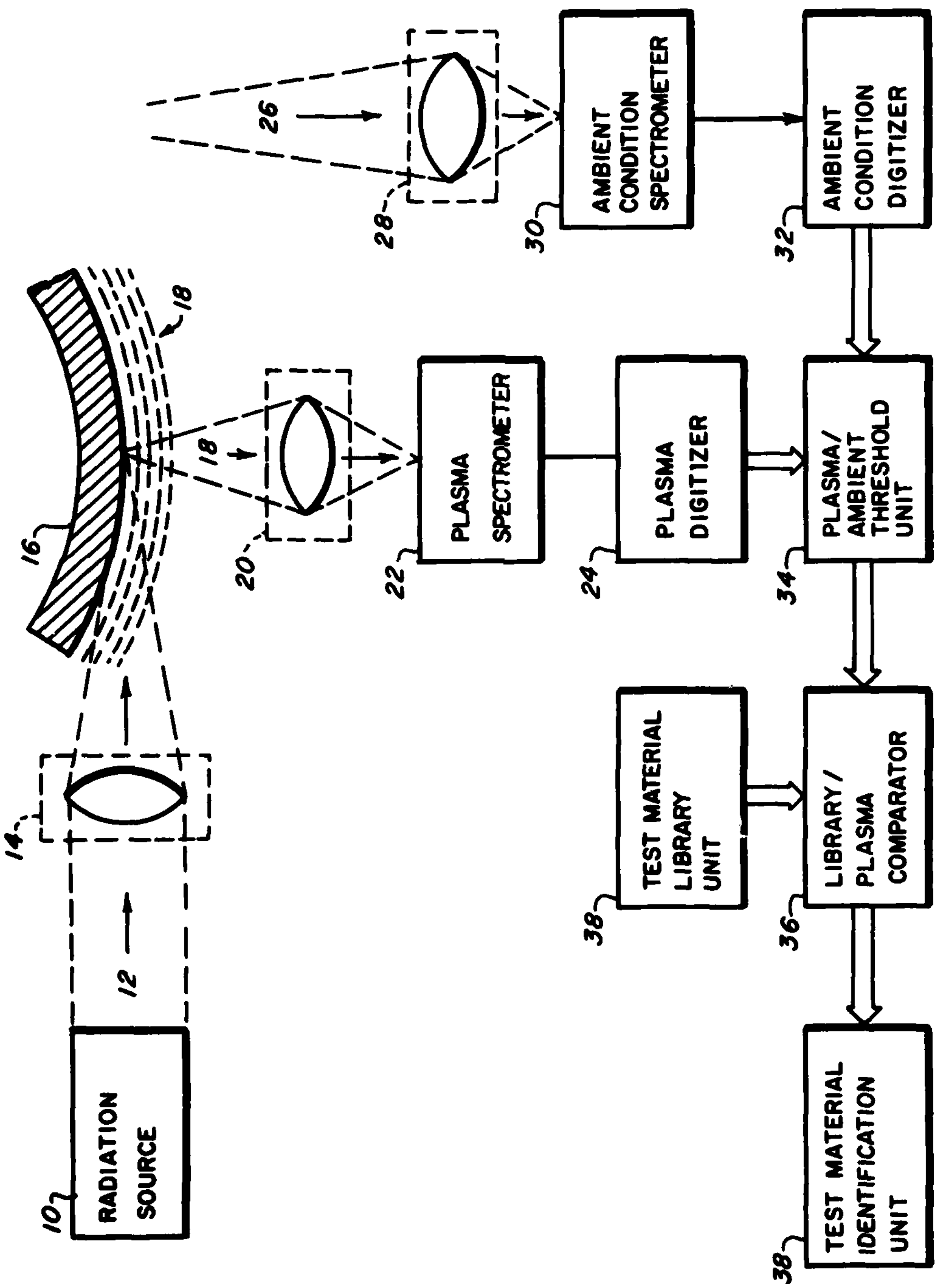

Navy Tech. Cat. No. 3806 ____ Navy Case No. 67,829

A METHOD OF REMOTE OPTICAL SPECTROGRAPHIC ANALYSIS OF TEST MATERIALS

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Abstract

A part of the energy emitted by a test material excited by a beam from a radiation source is collected and spectrally analyzed by a system comprising, inter alia, the aforementioned radiation source and a focusing unit. After focusing in the focusing unit, the beam produces a plasma at the surface of the test material. A collection optics means is configured to intercept a part of the energy emitted by the plasma and a part of the energy corresponding to the ambient condition. The system is configured such that the energy corresponding only to the plasma is separated into its spectral components. Units for recording the spectrum and comparing it with a catalogue of spectrums are also included in the system.

Description

As shown in the Figure, a radiation source 10 generates a beam of electromagnetic radiation, for example a light beam 12, which is focused, by a focusing unit 14 onto a test material 16 under analysis. The

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radiation source 10 is configured such that the light beam 12 is powerful enough to cause very rapid heating of the surface of the test material 16 so as to cause a plasma 18 to be formed contiguous to the surface thereof. Optical radiation is emitted from the plasma 18 and a part thereof 18' (comprising plasma and ambient radiation) is collected by a plasma collection unit 20. The plasma 18 is formed when the temperature of the surface of the test material 16 reaches a predetermined level. At this temperature level the plasma 18 emits radiation consisting of a continuous spectrum of light superimposed upon line spectra characteristic of the test material 16 and the ambient conditions surrounding it. To continue, the light energy collected by the plasma collection unit 20 impinges upon a plasma spectrometer 22 where it is separated into its spectral components in analog form. The analog output of the plasma spectrometer 22 is converted into a representative digital word by a plasma digitizer 24.

Similarly, ambient optical radiation 26 emitted by the test material 16 and the test environment is collected by an ambient light collection unit 28. The light energy collected by the ambient light collection unit 28 impinges upon an ambient condition spectrometer 30. The ambient condition spectrometer 30 is configured to separate the ambient optical radiation 26 into its

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spectral components in analog form. The analog output of the ambient condition spectrometer 30 is then converted into a representative digital word by an ambient condition digitizer 32.

Correction for the effects of the atmosphere, i.e., the ambient conditions, on the radiated spectrum is carried out in a plasma/ambient threshold unit 34 which operates on the outputs of the plasma digitizer 24 and the ambient condition digitizer 32 so as to form an output digital word representative only of the spectrum of the plasma 18, and, accordingly, the test material 16. This output feeds one input of a library/plasma comparator 36. The other input of the library/plasma comparator 36 is fed from a test material library unit 38, which contains a catalogue of plasma spectra for various materials of the type to be tested. Thus, a comparison operation is performed in the library/plasma unit 36. When a match is made, a digital word corresponding to the test material is fed into a test material identification unit 40. This unit decodes the information at its input and displays identification characteristics of the test material 16, i.e., its constituents.

Advantages and Features

The system described is configured to determine the constituents of a test material that is remotely

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AD-A146 946 TECHNICAL DISCLOSURE BULLETIN VOLUME 10 NUMBER 1 SEPTEMBER 1984(U) OFFICE OF NAVAL RESEARCH ARLINGTON VA SEP 84

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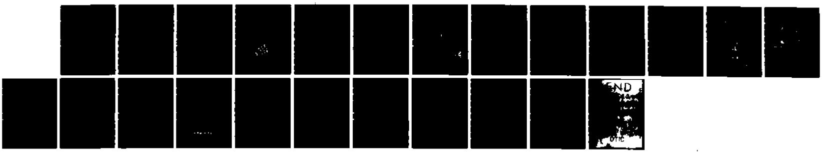

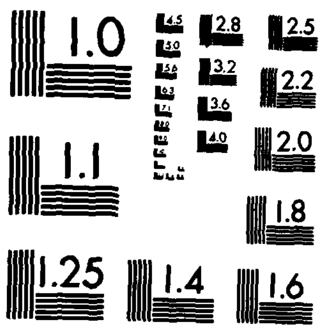
1.0
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6.3
2.8
3.2
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2.0
1.1
1.8
1.25
1.4
1.6

situated. The system also corrects for the effects of atmosphere, i.e., ambient conditions, on the radiated spectrum of the material to be tested. The reference spectra stored in the test material library unit can be determined by using the technique disclosed under laboratory conditions. The reference spectra can be changed and updated at will.

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Navy Tech. Cat. No. 1613 Navy Case No. 67387

BOWED BRUSH SLIP RING

Rudy S. Kemka

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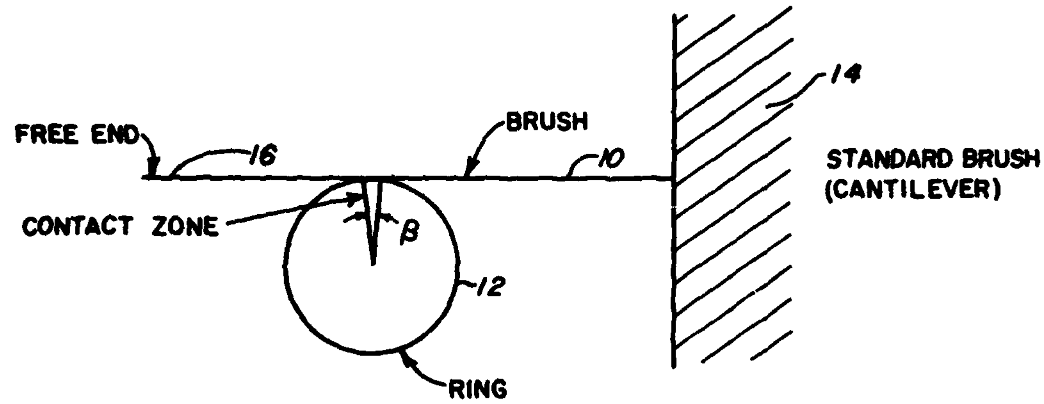

FIG. 1

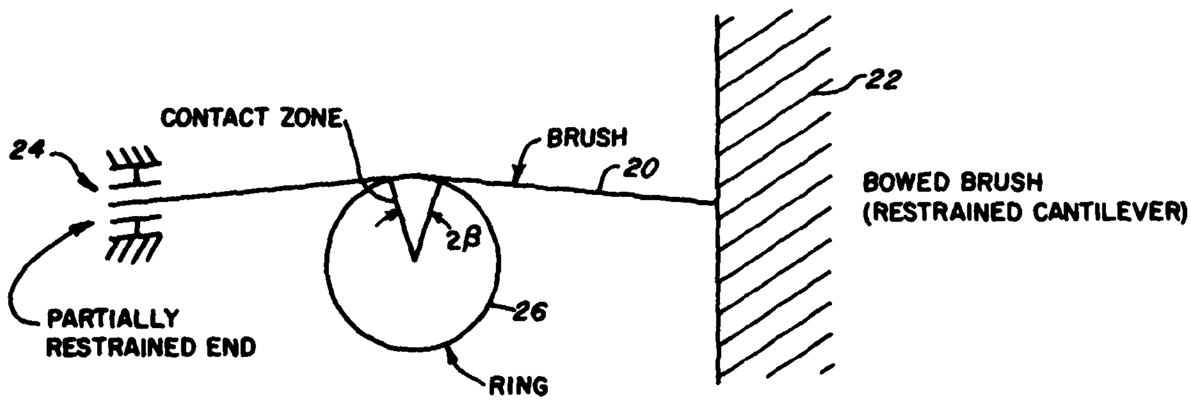

FIG. 2

Navy Tech. Cat. No. 1613 Navy Case No. 67387

BOWED BRUSH SLIP RING

Rudy S. Kemka

The Singer Co., Little Falls, N. J

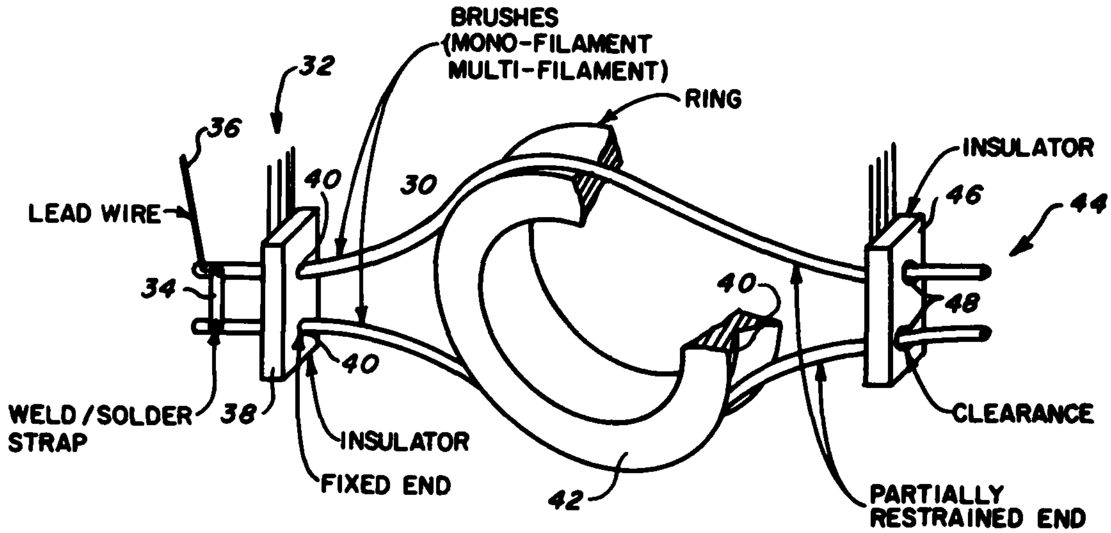

FIG. 3

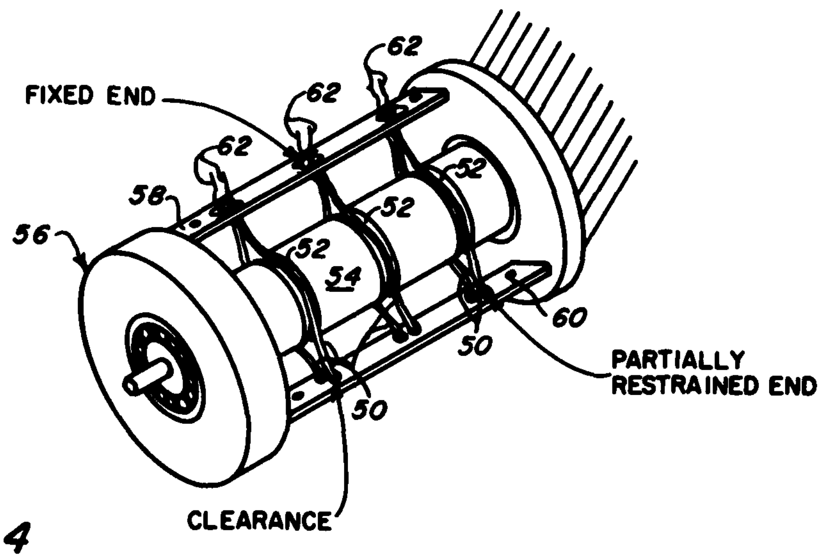

FIG. 4

Navy Tech. Cat. No. 1613 Navy Case No. 67387

BOWED BRUSH SLIP RING

Rudy F. Kemka

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Abstract

An electrical rotating machinery electrical connection between a rotating member and a fixed member is provided by the use of a bowed brush pair sliding on a conventional V grooved slip ring. Each of the bowed brush pair is placed on the same slip ring so that both brushes are contacting the ring. The brush pair are fixed at one end by an insulating material and connected to each other by a conducting strap. Lead wires from the fixed member connect to one of the brushes or the conducting strap at this one end. The other end is partially restrained by an insulating material similar to the insulating material at the one end.

Description

Referring now to FIG. 1 there is shown a standard prior art brush cantilever arrangement with a brush 10 and a slip ring 12. The brush is anchored at one end 14 and is free at the other end 16. The brush has a contact zone over an area subtended by an angle β of the slip ring 12.

FIG. 2 shows a new arrangement in which a brush 20 is anchored at one end 22 and partially restrained at the other end 24. The brush 20 has a contact zone over an area subtended by an angle 2β of a slip ring 26.

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Referring now to FIG. 3 there is shown brushes 30 connected together at the restrained end 32 by conducting strap 34. A lead wire 36 connects to brushes 30. An insulator 38 having apertures 40 filled with epoxy holds the brushes 30 in place. The brushes 30 can be mono-filament or multi-filament. The brushes 30 ride in the V groove 40 of slip ring 42. Partially restrained end 44 has an insulator 46 having apertures 48 for brushes 30.

FIG. 4 shows an assembly of a plurality of bowed brush slip rings. The brushes 50 ride in respective V grooves of slip rings 52. The slip rings are affixed to a rotor 54 that rotates within housing 56. Insulator 58 is located at the restrained end and insulator 60 is at the partially restrained end. Wires 62 connect to brushes 50.

Advantages and Features

The superiority of the bowed arrangement of the brushes to the standard cantilevered brush is that the brush/ring contact area is significantly increased as a result of the bowing. This can be seen by comparing FIGS. 1 and 2. FIG. 1 shows a contact area over the area subtended by an angle β for the cantilevered arrangement and an angle 2β for the bowed brush arrangement. This increased contact area results in lower electrical noise. In addition, lower contact forces are needed resulting in a reduction in wear. Improved vibration characteristics are also realized.

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RETROREFLECTING PASSIVE DATA TRANSMITTER

David A. Rosenthal

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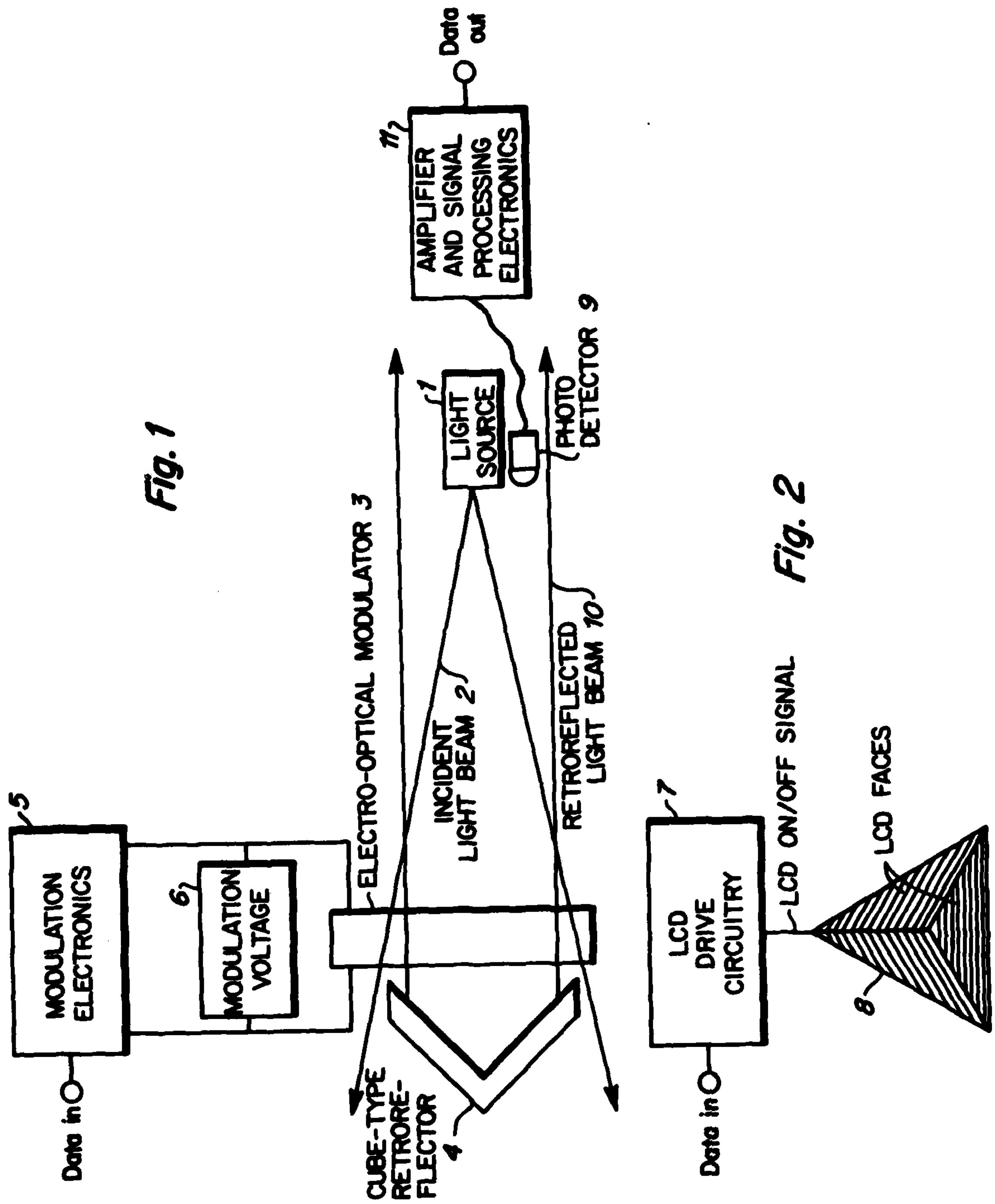

Navy Tech. Cat. No. 7470 ____ Navy Case No. 67085

RETROREFLECTING PASSIVE DATA TRANSMITTER

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Abstract

A passive optical line-of-sight data transmission system includes a retroreflector which, in conjunction with modulating electronics, causes an unmodulated incident light beam to be returned to its point of origination in a modulated information-bearing state.

Description

There exist many applications which for reasons of security, safety or the constraints of physical surroundings will benefit from the capability to transmit data optically from a remote location. In the data transmission system herein disclosed a light source, remote from the location at which data is originated, directs a light beam at a retro-reflector located at the point of data origination. The unmodulated incident light beam produced by the light source is intensity modulated in either of two ways prior to being reflected back toward the light source.

In a first embodiment, illustrated in Fig. 1, light source 1 produces incident light beam 2 which passes through an electro-optically active light modulator 3 set in the optical path. Modulator 3 is located in close proximity to cube-type retroreflector 4 which by design operates to reflect incident light back to its source. Modulator 3 may

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be a Pockels Cell or any other electro-optical device capable of proportionately and precisely controlling the intensity of light passed through it in response to the controlled application of an electric field.

Modulation electronics 5 are responsive to a data input signal and produce a corresponding modulation voltage 6 which is imposed upon and acts to proportionately vary the light transmission properties of modulator 3. Modulator 3 is capable of responding to frequencies from DC to greater than 10 GHz making possible the transmission of precise analog signals as well as high-rate digital signals. In the digital mode of operation modulator 3 is a two state device. In a first state modulator 3 is opaque and non-reflective in response to the modulation signal produced by electronics 5 with the result that no incident light is passed or reflected towards its point of origination. In its second state, modulator 3 is optically transparent allowing incident light to be passed and reflected with its intensity undiminished. In the analog mode of operation the intensity of light passed by modulator 3 and reflected by retroreflector 4 varies as a function of the analog signal produced by modulation electronics 5 which is determinative of the degree of optical transparency of modulator 3.

In a second embodiment modulator 3, retroreflector 4 and modulation electronics 5 are replaced by the liquid crystal drive circuitry 7 and liquid crystal faced

retroreflector 8 of Fig. 2. This embodiment is capable only of a digital mode of operation. The incident light beam facing surfaces of retroreflector 8 are planar and display specular reflection properties when in an OFF state and act essentially as light absorbers in an ON state. Circuitry 7 produces a drive signal in response to the data input signal received. The signal produced by drive circuitry 7 is determinative of the state of the liquid crystals of retroreflector 8. Digital data transmission can be accomplished at a rate commensurate with the ability of the liquid crystals to change state.

In both of the embodiments described above a photo-detector 9 is colocated with light source 1 and is capable of detecting the intensity of intensity-modulated retroreflected light beam 10. In a digital operational mode detector 9 senses periods of light absence and light presence. In the analog mode of operation detector 9 detects the degree of intensity of the retroreflected light signal received. In both embodiments detector 9 produces a signal corresponding to the intensity of the reflected light received. Amplifier and processing electronics 11 produce a digital or analog signal in response to the signal produced by detector 9 which carries the information originated at the remote site.

In practical application use of a laser light source ensures that the light beam incident on the

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retroreflector is intense, monochromatic and as well defined as possible. The photodetector utilized for receipt of the retroreflected signal is optimized to the emission wavelength of the laser. A narrow band-pass optical filter may be placed in front of the photo-detector and a telescope placed in the optical path to improve system alignment and light gathering ability. Additionally, an array of retroreflectors can be employed to ensure the impingement of an incident light beam on at least one retroreflecting surface.

Advantages and Features

The optical data transmission system offers a secure means of passing information at a high rate of speed from a remote location. The system is a passive, low cost, essentially line-of-sight system which produces no detectable electro-magnetic emissions in operation.

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CONNECTOR TOOL

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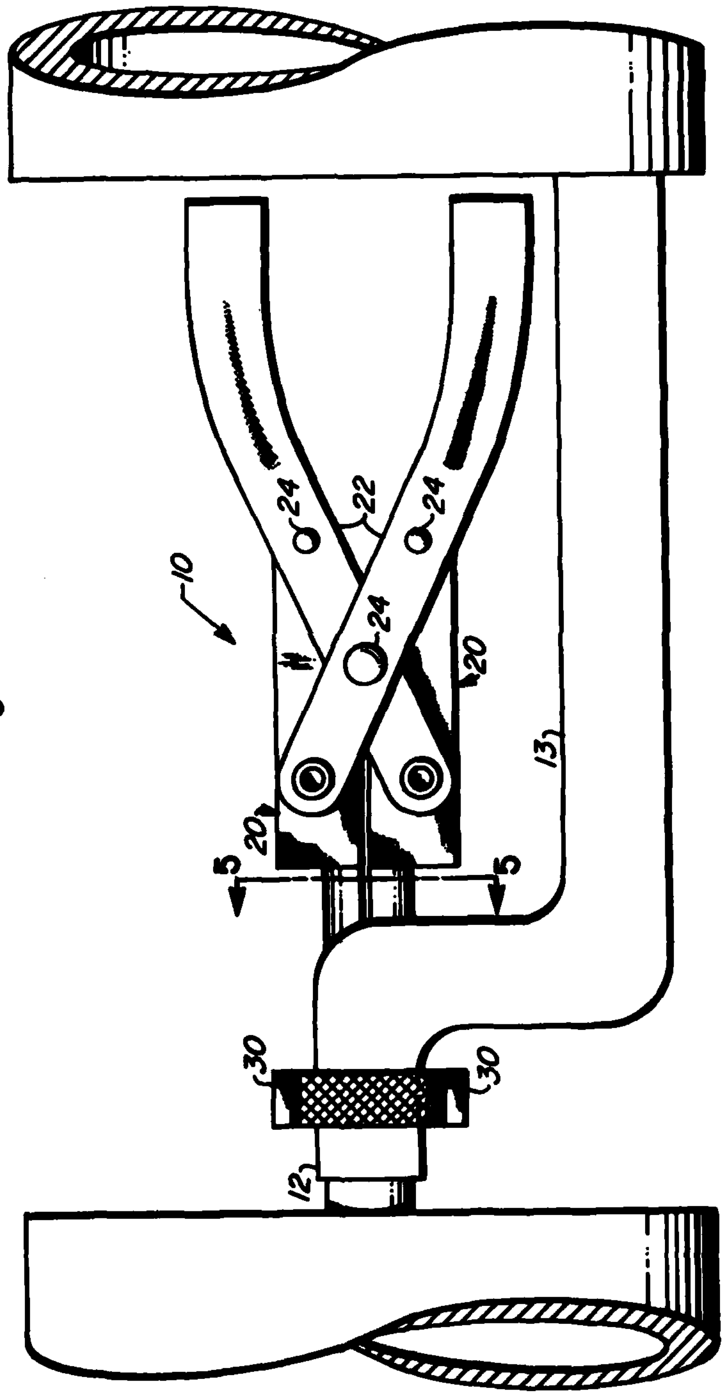


Fig. 1

CONNECTOR TOOL

Herman R. Kollmeyer, Nicholas R. Zagala

Naval Weapons Center, China Lake, California

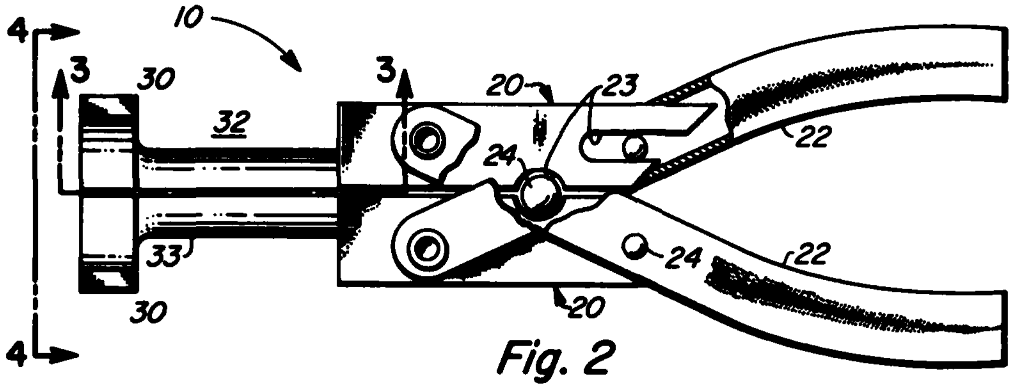


Fig. 2

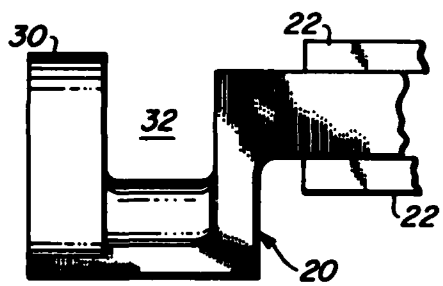


Fig. 3

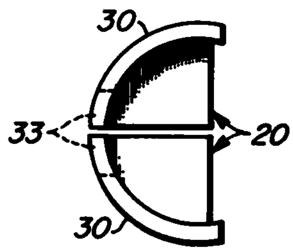
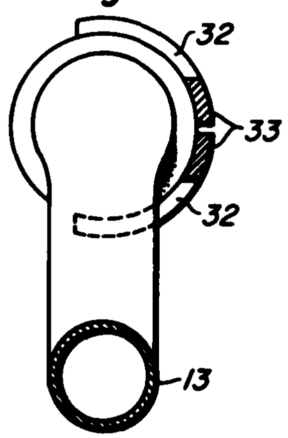


Fig. 4

Fig. 5



Navy Tech. Cat. No. 1530 ____ Navy Case No. 67858

CONNECTOR TOOL

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Abstract

A tool for grasping a generally cylindrical electrical connector which is released by a partial rotation and to which access is restricted axially. The tool has handles and jaws arranged as in parallel jaw pliers, each jaw being arcuate so as to conform to the connector and being cut away for a cable extending radially thereof.

Description

Subject tool 10 is for use, as shown in Fig. 1, for grasping an electrical connector 12 to which access is restricted axially and from which a cable 13 extends radially. The tool has a pair of unitary jaws 20 mounted in handles 22 in a well-known arrangement used in parallel jaw pliers. The jaws have slots 23, as shown in Fig. 2, in which a portion of the handles are shown broken away, to receive the usual pins 24 of the handles. Oppositely of handles 22 the jaws have individual arcuate portions 30, best seen in Figs. 1-2, conforming to connector 12 and disposed to move toward each other as the handles are squeezed. Each jaw 20 is cut away as indicated by numeral 32, leaving a stem 33 by which arcuate portion 30 is connected to the balance of the jaw and providing an

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opening, as seen in Figs. 1 and 5, for radially extending cable 13.

Advantages and Features

A prior art device for the purpose of the subject tool utilizes arcuate jaws mounted individually on collet portions drawn into a conical surface by a screwthread arrangement motivated by a T-handle. The subject tool is substantially simpler and thus more economical to manufacture than such device, is more convenient to manipulate since only one hand is required, is faster since only a single grasping movement is required, and has jaws which are substantially stronger and not subject to breakage as in the prior art device.

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Navy Tech. Cat. No. 5260 Navy Case No. 68361

A SOI-CMOS PROCESS FOR VLSI TECHNOLOGY

Satwinder D. S. Mathi

Texas Instruments Incorporated, Richardson, TX

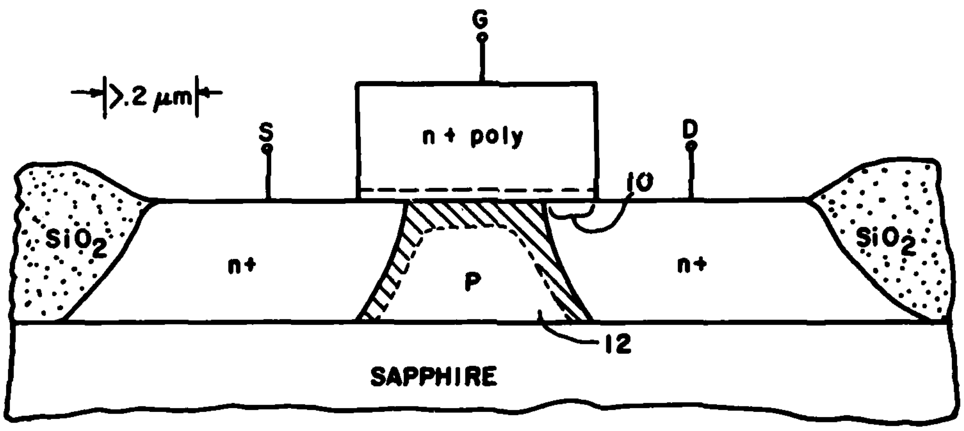

FIG. 1

A SOI-CMOS PROCESS FOR VLSI TECHNOLOGY

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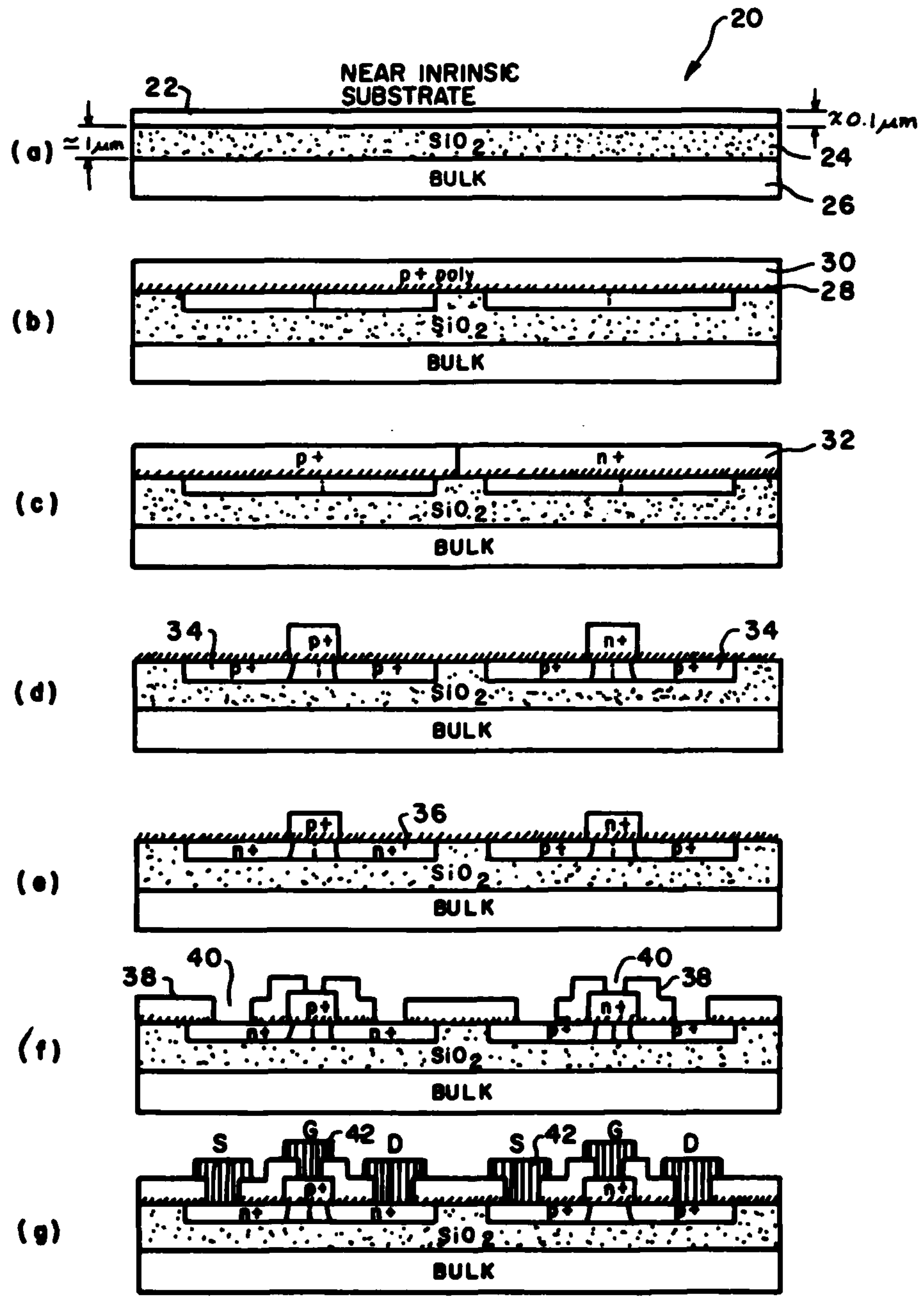

FIG. 2

Navy Tech. Cat. No. 5260 ____ Navy Case No. 68361

A SOI-CMOS PROCESS FOR VLSI TECHNOLOGY

Satwinder D. S. Malhi

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Abstract

A silicon-on-insulator (SOI) CMOS process for VLSI technology uses a thin near intrinsic substrate. A very thin (1000A - 1500A) undoped, near intrinsic silicon substrate overlayed on a thick layer of thermal SiO_2 on silicon bulk is the starting material. Interdevice isolation is achieved by standard LOCOS and gate oxide is grown. A polysilicon layer for gate material is doped p^+, counterdoped n^+, and patterned to define gate regions. Blanket p^+ and n^+ implants form source and drain regions. Phosphosilicate glass is deposited and patterned for contact windows, and aluminum is evaporated and patterned for the contacts.

Description

CMOS processes on silicon-on-silicon (SOS) use an epitaxial silicon with thickness ranging from 0.5 - 0.8 μm and doping which is generally larger than 10^{15} cm^{-3}. As shown in Figure 1 this methodology results in some problems. First, due to the relatively thick substrate used, gate-drain overlap 10 is quite large, increasing parasitic capacitance and short channel effects. Second, the doping density in the substrate is such that a part of it is left neutral creating a floating substrate 12 which results in decreased speed. Third, isolation schemes do not easily submit to scaling, a perpetual problem

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with thick substrates. Fourth, high doping density in the substrate reduces the driving capability of the device due to reduced mobility and mobile channel charge density.

The process flow graph for the SOI-CMOS process is shown in Figure 2. The starting material 20 is an undoped, near intrinsic silicon substrate 22 0.1 to 0.15 μ m thick overlayed on a thick layer of thermal SiO_2 24 on silicon bulk 26 as shown in Figure 2(a). Interdevice isolation is achieved by standard LOCOS and gate oxide 28 is grown. A polysilicon layer 30 for gate material is deposited and doped p^+ as shown in Figure 2(b). The polysilicon 30 is then selectively counter-doped n^+ for n-channel gate material 32 as shown in Figure 2(c). The polysilicon layer 30/32 is patterned to define gate regions, and a blanket p^+ implant 34 for p-channel source and drain is made as shown in Figure 2(d). A selective $\underline{N}^+$ implant counter-doping produces the n-channel source and drain 36 as shown in Figure 2(e). Now phosphosilicate glass 38 is deposited and patterned for contact windows 40, shown in Figure 2(f). Finally aluminum contacts 42 are evaporated and patterned as shown in Figure 2(g).

Advantages and Features

The SOI-CMOS process uses a very thin, undoped insulating silicon substrate. Since the substrate is thin, it is always depleted of carriers, eliminating the parasitic bipolar action of a floating substrate. Also standard LOCOS can be used for isolation without creating step or leakage problems,

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and the lateral encroachment is minimized to allow higher packing densities and decreased overlap capacitances associated with source-gate and drain-gate terminals.

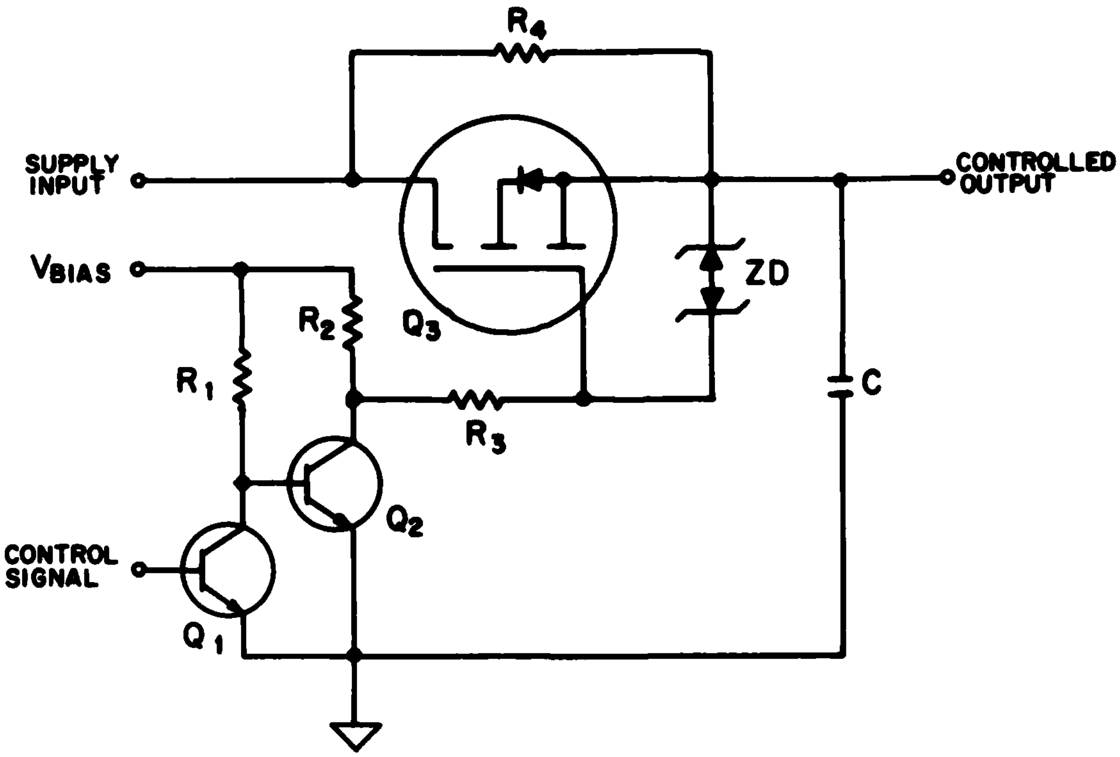
Since the substrate is undoped, it saves a mask generally needed to obtain substrate islands of different doping types, it permits better threshold voltage control and higher channel mobility, and it eliminates short channel effects due to charge sharing between gate and source as well as gate and drain.

Finally p^+ polysilicon on n-channel device and n^+ polysilicon on p-channel device permit controlled enhancement threshold voltages on the intrinsic substrate.

Navy Tech. Cat. No. 6841 Navy Case No. 68283

A HIGH CURRENT DC SWITCH

Danny E. Novinger
Brian Klosterman
Rockwell International Corp., Dallas, TX



Navy Tech. Cat. No. 6841 Navy Case No. 68283

A HIGH CURRENT DC SWITCH

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Brian Klosterman

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Abstract

A high current DC switch uses a low voltage control signal. An N-channel enhancement-mode FET is driven by TTL level drive voltages via NPN transistors to control the FET gate voltage.

Description

Referring now to the Figure a first transistor Q_1 is connected in a common-emitter configuration between ground and a bias voltage V_{BIAS}. The output of Q_1 is connected to the base of a second transistor Q_2, also connected in a common-emitter configuration. The output of Q_2 is connected to the gate of a field-effect transistor Q_3. The source of Q_3 is connected to the supply input and the drain is connected to the controlled output.

In the absence of a control signal at the base of Q_1, V_{BIAS} via the collector resistor R_1 of Q_1 biases Q_2 "on", effectively shunting the gate of Q_3 below its turn-on voltage and holding Q_3 "off". When the control signal is applied to the base of Q_1 to turn Q_1 "on", the base of Q_2 is essentially grounded, turning Q_2 "off". The collector of Q_2 rises to V_{BIAS}. V_{BIAS} is approximately 10V higher than the voltage on Q_3 drain, depending upon the drive requirements of Q_3. As V_{GS} on Q_3 exceeds

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zero Q_3 starts to conduct drain source current. As V_{GS} approaches 10V the drain-source resistance approaches its minimum, thereby acting as a switch. Removal of the control signal reverses the process and turns off Q_3.

Advantages and Features

The high current DC switch uses TTL level drive voltages to control a high current FET switch.

U.S. GOVERNMENT PRINTING OFFICE 1984 421-262/575

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